JAN 1 0 1927

RUARY Homemade "B" Eliminator — Page 301 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK GREAT BRITAIN No. 410428 REG. U.S. PAT. OFF.

SEE PAGE 272

ATKINS METAL CUTTING SAWS

Mr. Happy Man Says:

"SILVER STEEL Hack Saw Blades Last Six Times as Long"

TESTS show that the new ATKINS "Silver Steel" Hack Saw Blades for hand use will cut *twice* as fast, and last at least *six times* as long, as any other hack saw blade you ever used.

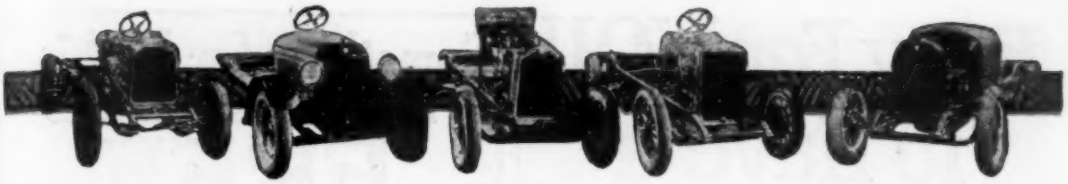
Think what a saving of time, money and effort this means to you on all your hack saw work. What it means to do a metal-cutting job in *half* the usual time —to have a hack saw blade that will outlast *six* ordinary blades! "Silver Steel" blades keep their teeth and will not snap.

You should be using these wonderful new blades NOW. Ask your hardware dealer to show you these new and better blades. If he cannot supply you, write us and tell us what kind of metal you are cutting, enclosing 25c, and we will send you a sample "SILVER STEEL" blade.

E. C. ATKINS & CO., *Est. 1857*
426 S. Illinois St., INDIANAPOLIS, IND.

Leading Manufacturers of Saws, Saw Tools, Saw Specialties and Machine Knives

ATKINS - SILVER - STEEL
MADE IN U.S.A.



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Are you mechanically inclined? If so, then read every word of my message. Right this minute I am placing an opportunity before you to win rapid promotion and a future success which you can make just as big as you want to. 100,000 more trained auto men are needed at once. It's a wonderfully big paying field. It's the biggest business in the world! It is growing so fast that at present there are 269 cars to every repair shop. It is your marvelous opportunity. Come to Detroit now and learn this business right. Within a short time I will send you out on the road to big money.

DETROIT TRAINED MEN GET THE GOOD PAYING JOBS

Three-quarters of all the cars are made right here. Wherever autos are used—Detroit trained men get the good jobs, highest pay. Study autos where they are made. Learn at the famous Michigan State Automobile School—unanimously endorsed by the auto industry. This school knows how to **train you right,** and that is what you want and need to make the most money in this fascinating business. Come at once. If necessary, we'll assist you in securing part-time work to earn money each week. Students who enroll in our evening courses are assisted to full-time day jobs. (Ask for details, and when writing please explain your circumstances fully.) We help place many of our graduates directly. **This employment service is absolutely free.**

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Get all the interesting facts. Mail the coupon at once for big FREE Catalog and for full information concerning your future. It's illustrated with photos of school equipment, factory production and other interesting matter. It contains hundreds of letters from our successful graduates.
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Now *you, too,* can build a prosperous, well-paying business! No capital or previous training needed. Wonderfully thorough professional method correctly trains you in clever show card making—right at home—and quickly prepares you for an uncrowded, fascinating field of really surprising money-making possibilities.

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Send at once for FREE illustrated, descriptive booklet outlining this whole attractive business, telling exactly how to start and conduct your business and giving full details of our practical home study course. Don't delay. Be independent. Earn a good income. Own your own business. Mail coupon **NOW!**

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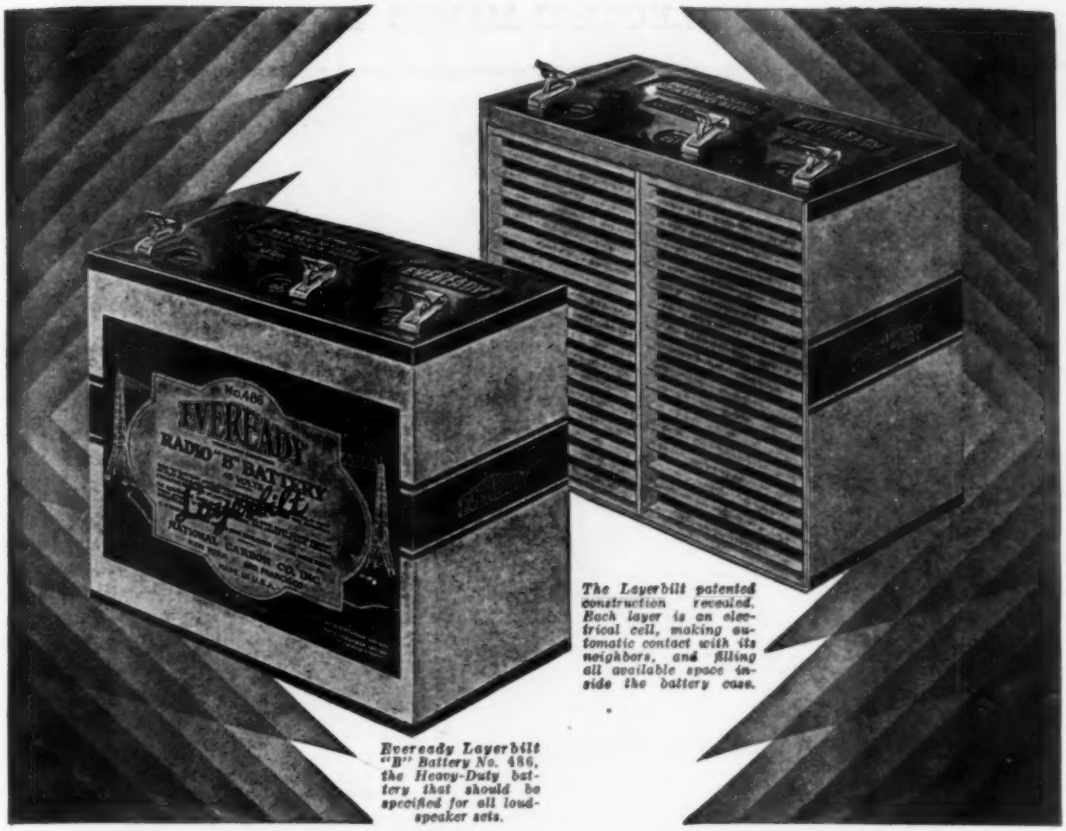
No.486
EVEREADY
RADIO "B" BATTERY
Layerbilt
NATIONAL CARBON CO. INC.
NEW YORK
AVERAGE
The Layerbilt patented construction revealed. Each layer is an electrical cell, making automatic contact with its neighbors, and filling all available space inside the battery case.
Eveready Layerbilt "B" Battery No. 486, the Heavy-Duty battery that should be specified for all loud-speaker sets.

This is the Heavy-Duty Battery in which the new Layerbilt construction provides greater economy

THERE's an important discovery in radio economy awaiting all users of loud-speaker sets who have been buying the smaller Light-Duty "B" batteries instead of the large Heavy-Duty size required by such sets. Because the Light-Duties cost somewhat less to buy they seem like an economy, but the surprising fact is that the Eveready Layerbilt No. 486 lasts more than twice as long though it does not cost anywhere near twice as much. It is, therefore, much more economical—we believe it to be the most economical "B" battery ever built.

Eveready Layerbilt's remarkable life is due to its unique construction. All other dry cell "B" batteries are assembled of cylindrical cells, with much waste space between them, and many soldered connections bridging the gaps.

The Eveready Layerbilt, however, is built in layers of flat current-producing elements, making automatic connection with each other. Every available inch inside the battery is occupied usefully. You get more battery for your money, and that battery is more efficient.

Remember this about "B" batteries: All loud-speaker sets require Heavy-Duty batteries, and the Eveready Layerbilt has proved time and again to be the longest lasting and most economical Heavy-Duty "B" battery.

Manufactured and guaranteed by

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New York San Francisco
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WFI—*Philadelphia*	WCCO—*Minneapolis, St. Paul*
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DIVING BALL'S ELECTRIC HANDS TO GRIP WRECKS

Huge Steel Diving Ball, Made in Oregon, to Descend 500 Feet under Sea

Powerful Magnets Hold the Ball to the Ship's Side, While an Electric Drill Pierces the Hull; Lights Illuminate the Sea, and Air Tanks Provide Oxygen

Popular Mechanics Magazine
REGISTERED IN U. S. PATENT OFFICE
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Vol. 47 FEBRUARY, 1927 No. 2

To Explore Sea Bottom a Mile under Water

Naturalist Plans to Break All Diving-Bell Records in Search of New Life amid Tropical Coral Far Beneath the Waves

PLANS to explore the bottom of the sea a mile beneath the surface have been completed by Dr. William Beebe, director of tropical research of the New York Zoological society, who a year ago explored the mythical mysteries of the Sargasso sea. He is planning a special steel cylinder with a small glass window, both capable of withstanding the enormous pressure at a depth of 5,000 feet. Oxygen apparatus, carried inside the cylinder, will eliminate the air line used by divers, and reduce the connection with the surface ship to a single steel cable, which also will carry a telephone line.

"No human being has ever visited the deepest part of the ocean," Dr. Beebe says. "It is perfectly simple, however. You have a tight cylinder, with a screwed-on top which cannot possibly work loose with a pressure of a ton to the square inch at 5,000 feet below the surface. You make your own oxygen inside the cylinder as you need it. Physicists assure me the thing is entirely practical. The only reason no one has ever attempted a descent to these depths before, is that there is no financial advantage to be gained from such a trip."

Marie Poland Fish, the Young Biologist Who Hatched the Eel's Eggs Discovered by William Beebe's 1925 Expedition, Thereby Solving a 2,000-Year-Old Mystery

"What do you expect to find?" he was asked.

"If I knew, I wouldn't go down," the naturalist retorted. "It will be perfectly brilliant down there under the sea, for most of the deep-sea fishes carry their own lighting plants. Usually they die when brought to the surface, but I managed to keep one alive for a few moments on the Sargasso expedition, and when it was carried to the dark room, it became suffused with a most exquisite pale-green light."

Dr. Beebe has used ordinary diving equipment on several of his expeditions and become an experienced diver. He sailed shortly before Christmas to spend four months in the coast waters of Hayti, and took with him a hand motion-picture camera, completely inclosed in a water-tight steel case, to take movies of the fish among the brilliant coral reefs of the tropics. He also took a stenographer along so that he could dictate, from the bottom, by means of his divers' telephone, an exact description of everything he saw.

"When I have been down heretofore I had to come up every ten minutes or so and dictate my observations," Dr. Beebe said, "and even then

the written record was limited to what I could remember and describe. It was like describing the circus after you reached home. With the telephone at hand I can describe everything just as it happens."

A three-masted schooner, with several tents on deck to supplement its living quarters, provided a home for this winter's expedition. Next year, however, when he plans to make the attempt to explore mile-deep water, the "Arcturus," the steamer used in the Sargasso expedition, will be outfitted again. Starting from New York, he plans to make his first descent off the New Jersey coast, going down over the edge of a deep-sea cliff known as the "Continental Shelf."

The importance of the work done by Dr. Beebe's expeditions was emphasized recently when it was announced that microscopic eggs, brought up by a deep-sea dredge from the edge of Challenger Bank, a shoal ten miles southwest of Bermuda, had been hatched out and proved to be eels. The discovery, made by Mrs. Marie Poland Fish, biologist of the United States bureau of fisheries, solved a mystery that has perplexed men since long before the Christian era. The ancient Greeks, unable to find any trace of the origin of eels, attributed their paternity to Jupiter.

Many years ago, however, scientists discovered that the common eels of both America and Europe journeyed to the deep and warm waters around the West Indies to spawn; that the old eels died there and never came back, but that eventually the young ones went unerringly back to the streams from which their parents had come. Tiny larvæ, barely one-fifth of an inch long, were brought up from depths of 600 to 1,000 feet, but until the discovery by Mrs. Fish no one had ever seen an eel's egg. To reach the spawning ground, the eels of Europe make journeys of 2,000 miles or more. The young eels take three years to return from the sea, spend five or six years growing to full length in fresh-water streams and then go back to sea.

Venus Flower Basket, a Flinty Deep-Sea Sponge Found near the Philippines

Pictures from "The New Natural History," by Prof. J. Arthur Thompson. Courtesy G. P. Putnam's Sons

Sea Horses, So-Called from Their Peculiar Heads, at Left; They Use the Tail to Anchor Themselves to Seaweed; at Right, a Giant Lizard Caught by Professor Beebe on Galapagos Island

GAS MOTOR REPLACES DOG TEAMS ON MINING SLED

For Winter Travel over Northern Snows; the Motor Sled with Its Caterpillar Drive and Big Front Steering Wheel; Sheltered Cabin in Rear Supports Searchlight

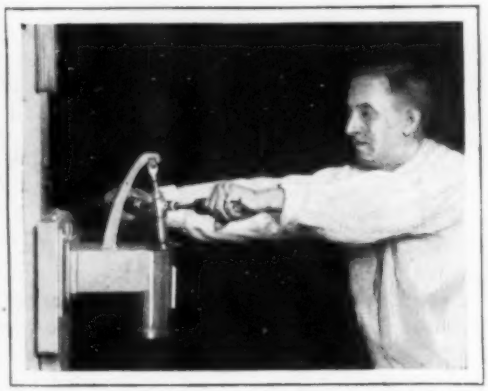
Motor sleds propelled somewhat like a caterpillar tractor have been adopted in the mining fields of northern Ontario and Quebec for travel and hauling goods between the small towns. They are steered by a single front wheel and can pass over drifts, as the chains that push it along keep the sled from sinking. A searchlight is attached to the front of the operator's cab at the rear for night travel.

SMUGGLING BIRDS TO ORIENT LATEST TRICK OF THE SEA

Following an embargo on shipments of song birds from Australia, a ring of smugglers has been active capturing the songsters and hiding them aboard ship in efforts to evade the custom officers. Not long ago, a number of love birds were found hidden under the stokehold plates in one steamer. On the same ship were four pheasants in a cardboard box between the vessel's side and a berth. The Oriental merchants often will pay $10 a pair for them. The trappers were fast depleting the stocks of birds when the government intervened.

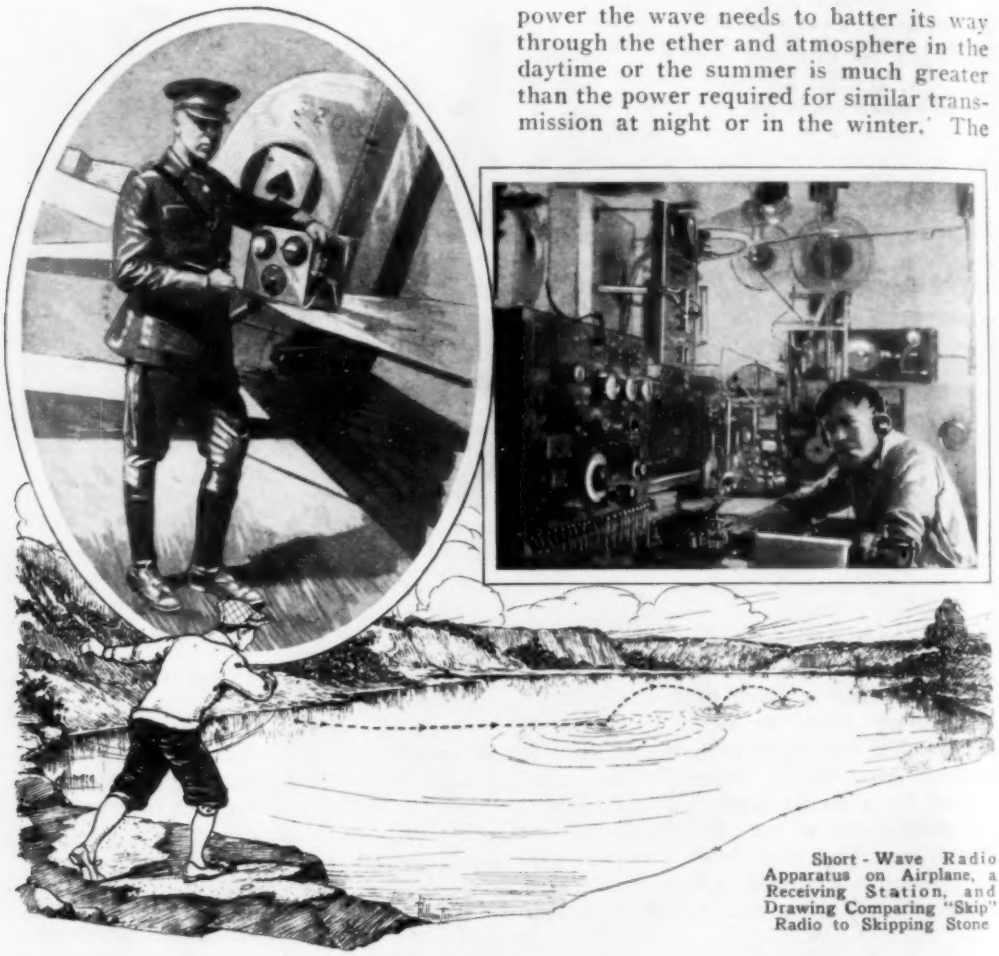
RODEO SPORT IS IMITATED BY WALL EXERCISER

Attached to the wall of the gymnasium or private room, a muscle developer is based on the principle of the bull-dogging contests at the rodeo. It has two handles which represent the animal's horns. The user grips these and endeavors to force a movable plate into a socket. This plate is pivoted against a strong spring at the bottom and the tension may be increased or diminished by turning a collar at the base, to represent the strength of a bull.



Carrying the Rodeo to the Gymnasium; Trying to Throw the "Bull" by Forcing Plate into Socket

"SKIP" WAVES GIVE RADIO DIRECTION AND SECRECY



Short-Wave Radio Apparatus on Airplane, a Receiving Station, and Drawing Comparing "Skip" Radio to Skipping Stone

The discovery of a radio wave, directional and possessing qualities which open a new field for development, has been announced by Maj. Francis E. Pierce, of the marine aviation expeditionary force. This wave "jumps" over any intermediate receiving station as desired by the operator, so that it is absolutely unaware that radio transmission is in progress. In a test between vessels of the United States fleet, one ship sent radio signals to another while a vessel which steamed between the two was unable to pick up the vestige of it. The exact distance of "skip" can be computed, so that naval vessels can make radio signals jump over enemy ships.

The length of the jump varies with the day and night and the seasons, because the power the wave needs to batter its way through the ether and atmosphere in the daytime or the summer is much greater than the power required for similar transmission at night or in the winter. The discoveries of Maj. Pierce are the result of a lifetime of research. Under his direction signals have been sent on forty-three meters from the west coast, from an aircraft, to Washington. To further bring the use of short waves to practical utility, the navy dispatched short-wave apparatus with the Lieut. Ben Wyatt mapping expedition to Alaska last summer, and his planes constantly communicated from Alaska with the fleet in southern California waters. Maj. Pierce is now pursuing experiments aimed to harness what is known as freak radio transmission. He believes that the long distances often attained by comparatively low-powered sets can be reduced from a freak to a common performance.

SPEED OF BIRDS

Tests of bird speed in calm air, made by a German investigator, show that the flyers have a wide range of rapidity and few equal the rate of a moderately fast train. Of those observed, the starling had the greatest speed, slightly more than forty-six miles an hour. Jackdaws made 38.22 miles an hour, the parrot finch, thirty-seven miles, rooks 32.58 miles and hooded crows and gray gulls, 31.05 miles. The sparrow hawk had the slowest speed of all the birds whose flights were measured, making but 25.70 miles an hour.

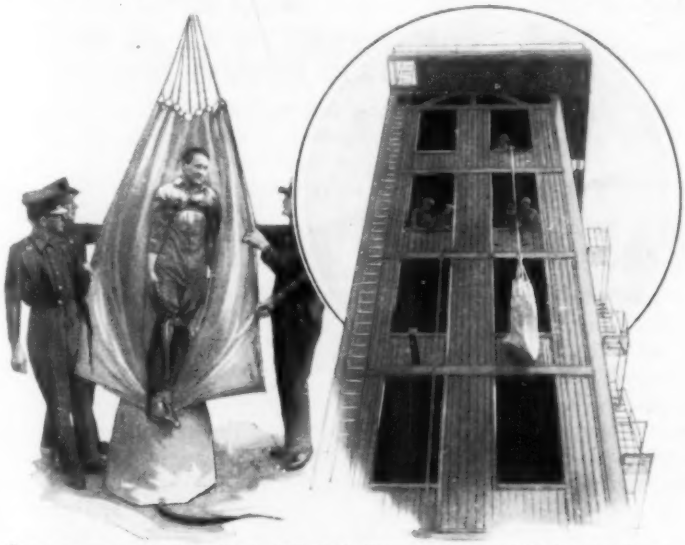
Teeing Off for the Slanting Target; the Ball Is to Be Sent through One of the Holes, Affording Excellent Putting Practice

GOLF GAMES PLAYED INDOORS IMPROVE PUTTING SKILL

Two interesting golf games can be played on an indoor outfit that gives helpful practice in putting and develops other fine points of the outdoor game. Regular balls and clubs are used, and there is no limit to the number of players. A tee is set up, ten feet or more from a slanting target containing five holes of different sizes. In one game, the score is determined by the number of points won for putting the ball through the holes, the smaller holes counting more points than the larger. In the other game, the score is kept as in an outdoor game, by counting the strokes required for holing out.

LIFE BAG AND STRETCHER AIDS IN FIRE RESCUES

To prevent injury to persons being taken from burning buildings, a combination bag and stretcher has straps to hold the victim securely while being lowered. The bands are fastened under the armpits and around the legs, whereupon the occupant is folded in the bag to give him further protection.



Demonstrating the Life Bag; "Victim" Securely Strapped inside the Covering, and Lowering Him from Tower

¶Largely due to activities in the radio field, an epidemic of invention appears to be sweeping the country, according to Thomas E. Robertson, commissioner of patents, his report showing that more than 110,000 applications for patents and trade-marks were submitted in the year ended June 30, 1926.

Off to a Spirited Dash for the Finish; the Tub Racers Warming into Their Rowing While Their "Mounts" Apparently Share the Excitement of the Event and Stretch toward the Tape

WATER JOCKEYS RIDE IN TUBS IN NOVEL OAR RACE

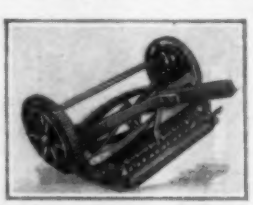
Thrills of the turf were humorously reproduced on the water at a Berlin carnival when oarsmen, dressed as jockeys, climbed into tubs bearing figures of horses' heads and brushes for tails. The race itself was a contest in paddling for the round tubs tended to spin about. The straining necks of the "horses" gave the effect of speed in spite of the actually slow rate of progress.

HOUSE LASTS HUNDRED YEARS AVERAGE FIGURES SHOW

According to a survey by engineers of the lumber manufacturers' association, the average life of a house is about 100 years. It was found that individual dwellings may last much longer but, on the average, structural depreciation sufficient to make the house unfit for further use occurs after a century. It also was discovered, according to one of the engineers, that frame dwellings depreciate in value only a little more than those of brick or masonry. It was pointed out that one of the commonest reasons for abandoning houses is that the neighborhood about them becomes undesirable for residence purposes, and the inmates move away although the dwellings may still be good.

COMB TEETH ON LAWN MOWER HELPS REMOVE WEEDS

Attached behind the cutting blades of the lawn mower, a comb arrangement is designed to remove weeds and other coarse growths from the grass. The teeth point backward and, on a reverse pull of the mower, cut or drag out the big weeds or raise them so that the mower knives may cut them. The comb is adjusted to the proper angle by means of thumbscrews, is easily regulated for rough ground, and the teeth are self-cleaning. Single ones may be removed and they may be sharpened as one blade or separately.



SOLDIERS TEST MAIL TUNNEL FOR AIR-RAID SHELTER

Sixty guardsmen offered to run the risk of possible suffocation recently in testing a post-office tunnel in London to determine if it could safely be used as a refuge in time of air raids. The men remained in the passage several hours and when it was noticed that they were becoming faint, as a result of the impure air, fresh supplies were pumped in to revive them. The experiments were conducted by government experts and their details were shrouded in secrecy.

BUMPER HAS NET OF CHAINS TO PREVENT INJURIES

Controlled by the emergency brake, a three-in-one bumper devised by a western inventor is intended to prevent serious injury to a person struck by the car. When not in use, it resembles an ordinary three-plated guard. When the hand brake is thrown in, one member of the bumper falls to within an inch of the ground and another rises above the center piece. A net of chains, hidden in a narrow trough back of the guards when the bumper is not in operation, connects the three parts, making a web to shield the person struck. At the base of the lower bumper is a heavy strip of rubber to prevent hands or clothing from being torn or the victim being dragged under the wheels. The action is achieved by a cable connected to the brake. This may be unhooked when the brake is used in parking and at other times when it might be in the way.

Bumper Extended, Showing the Elevated Section and the Net of Chains between the Guards

Using Light on Spectacle Frame to Inspect Teeth; Drawing Illustrates Position of the Lens

LIGHT ON SPECTACLE FRAME SAVES DOCTORS' EYES

Attached to a spectacle frame where it can direct the rays from between the eyes, a powerful little searchlight is an aid to physicians and dentists in making examinations, as it relieves eye strain and projects an effective illumination on the area under scrutiny. Current is supplied from a dry battery and the spectacles may be had without lenses or worn over the regular glasses. A feature of the light is that it can be turned off simply by tipping it back. The current goes on when the lamp is brought back to normal position.

FIFTY SEVEN HUNDRED PLANTS GROWN IN MEXICO

Some 5,700 known kinds of plants and trees that grow in Mexico have been listed by Paul C. Standley of the Smithsonian Institution after several years of research. Among these are woods from which fine cabinets are made, rubber and drug producers, the cocoa tree, oil-yielding palms and many fruits. A description of the plants includes their local names and their most important uses.

Wonder Metal *and*

What It Is

¶A metal the color of platinum.
¶Harder than the hardest tool steel.
¶Can be plated on iron, steel, copper, brass, etc.
¶Impervious to salt spray and all but two acids.
¶Practically unscratchable; so hard it cuts glass.
¶Melting at 3,000 degrees, it resists high temperatures.

AUTOMOBILE radiators and lamps that will neither tarnish, rust nor corrode are being plated in a Detroit automobile factory. In New York, ships' brass work is receiving the same plating to render it impervious to salt spray. In Chicago, exactly the same treatment is being given some 1,500 different articles to render them acid and tarnish-proof, to make them resist heat and terrific wear, and to protect cutting edges by making them harder than the hardest tool steel.

The material of this novel electroplating process is chromium—by no means a new metal, but one which up to three years ago had resisted all efforts to utilize it in practical plating processes. Within the past few years, however, a half dozen investigators, working independently, have perfected chromium-plating processes and brought one of the wonder metals of the world into everyday use.

Chromium belongs to the same general family from which comes the tungsten for electric-light globes; and it is the presence of its salts that gives the emerald its beautiful color. As a plating material it can be produced with a brighter gloss than nickel, something of the blue-white color of platinum and a wearing ability that the finest steel cannot equal and only the diamond surpass. For years it has gone into chrome steel for armor plate, and when the late Elwood Haynes, the famous automobile inventor, produced steelite, a tool steel harder than any made up to that time, he used chromium and cobalt in his alloy.

The bureau of standards, assigning the diamond an arbitrary hardness value of ten, rates chromium at nine and steelite, its nearest competitor, at eight. Like the diamond, anything coated with chromium will scratch glass and also the hardest steel plate.

Automobile valves plated with it can not be pitted by carbon and, at the end of 10,000 miles, show no visible sign of wear. One manufacturer is preparing to bring out a car in which the cylinder walls, pistons, valves and valve seats, crankshaft and wristpins—in fact, all the bearing surfaces—are plated with chromium. Machinery shafts and bearings plated with it have been in use for two or three years in several plants, and because of its great hardness show no wear.

Greaseless Frying Pans, Non-Stick Pie Tins and Samples of Untarnishable Table and Kitchen Ware, All Plated with Chromium

What It Means to You

Auto Lamps and Reflectors Plated by the New Process Never Corrode or Tarnish and Remain Bright for the Life of the Car

Files that have been plated with a coat so thin as not to interfere with the cutting edges have lasted three times as long as the best unplated steel files. Drills and other cutting tools show correspondingly increased life.

Plate a frying pan or pie tin with it, and you require no grease or lard, for the food will not stick. Coat the bottom of an electric iron and starch will not adhere, with the result that faster and better ironing can be done.

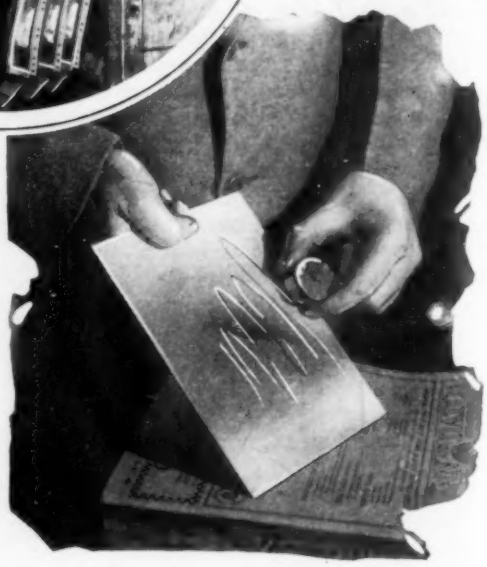
Those things have been done in the laboratory, though such plated products are not yet in general use. The reason is that chromium costs more than nickel, and in many lines manufacturers are moving cautiously toward adopting it. It costs about twenty-five cents to plate an average-size file in the plant of the Vacuum Can company, Chicago, where thousands of files and drills have been plated. They wear three times as long as an unplated file, so the cost of the steel file and the purpose for which it is to be used are the determining factors. It would cost as much to put a very thin coat on a five-cent tin pie pan or a ten-cent frying pan. As yet there is no demand for plated cooking utensils at those prices.

"Chromium," says B. O. Smith, president of the Vacuum Can company, "is a marvelous metal, but not a cure-all. It has a multitude of uses in which it gives marvelous results, but it requires a tremendously high amperage of electricity to get a good deposit, so, for the present at least, its use should be confined to articles where the cost of this electricity and the plating material and labor is not out of proportion to the price of the article.

"If we plate a fine surgical instrument for seventy-five cents, the plating cost is only a fraction of the value of the tool, and the advantage of a rust and tarnish-proof material which requires no drying

What It Means

¶ Greaseless and stainless frying pans.
¶ Electric irons that will not stick to starch.
¶ Files and drills that last three times longer.
¶ Auto, boat and plumbing parts that never tarnish.
¶ Auto valves that will not "pit."
¶ Table and kitchen ware that need not be wiped dry.



Courtesy Iron Age

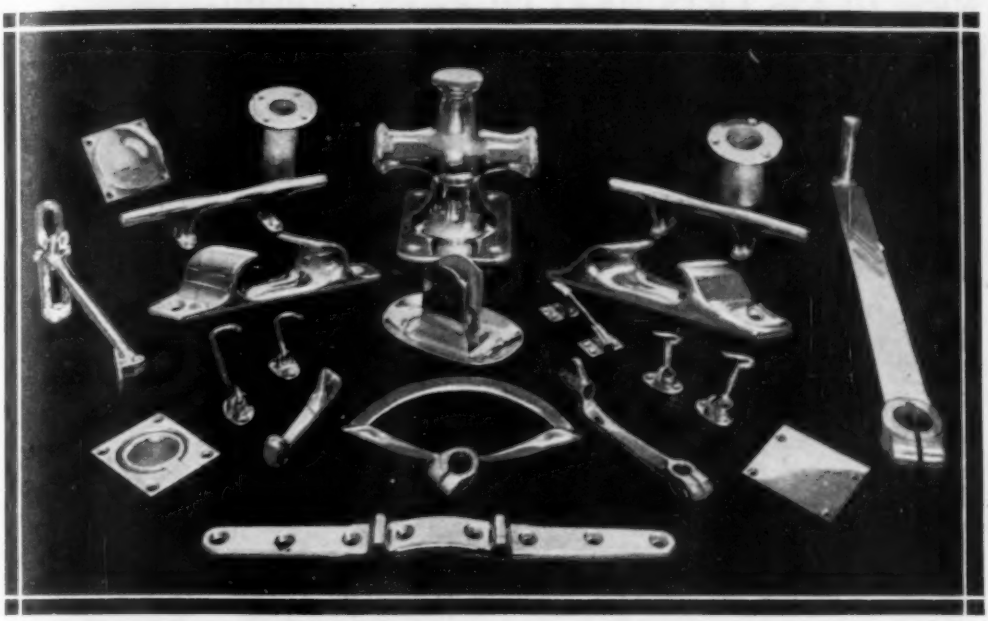
Golf Clubs and Metal Shafts Can Be Plated Either in a Bright or Satin Finish; Center Picture Shows Auto Radiators Being Plated; at Right, Scratching a Glass Plate with Pure Chromium

more than offsets it. But a kitchen knife or table cutlery, even though they require no drying after washing, do not justify the added expense and won't until a general demand arises.

Because of its hardness and its heat-resisting qualities—chromium melts at nearly 3,500 degrees—it is opening up an entirely new plating field in industry. Plated engine insides already are in use, along with plated shafting and tools. One of the big oil companies has had thousands of small copper tubes, used in its refining processes, plated to resist heat. The chromium coating raised the melting point of the copper tubing 700 degrees, and in tests it was found that even at that point the copper would melt out from beneath the shell and leave the chromium coat, only a few ten-thousandths of an inch in thickness, standing unharmed.

Plating for heat resisting, for rust and corrosion resistance, and for highly polished ornamental parts, such as automobile radiators, headlamps and reflectors, involves three different processes. The metal can be deposited, by variations in the plating process, either as a highly polished coat, a satin-finish effect, or in a dull, murky gray of almost the same shade as a warship's battle paint. The dull-gray coat has the highest heat resistance.

The control over the plating while it is being deposited in the tank is so accurate that, in experiments, safety-razor blades were coated with chromium without dulling their edge, while in use they lasted for many times the usual number of shaves, because of the hardness of the metal. Gauges used in machine shops are being built up to size after long wear by chromium plating, and one manufacturer is salving $30 hobs in which the shaft hole



Samples of Chromium Plating for Motorboat Parts, Designed to Resist Salt Spray; the Material Is Finding a Wide Use at Sea and Eliminates the Incessant Polishing of Brasswork

was slightly oversize by having them built up to dimensions by plating.

Colin G. Fink, of Columbia University, and associates, who developed one of the chromium-plating processes, has found a wide field of application in plating fine plumbing fixtures and such decorative ship parts as binnacles, bells and other brass fittings, which are constantly exposed to the corroding effects of salt spray.

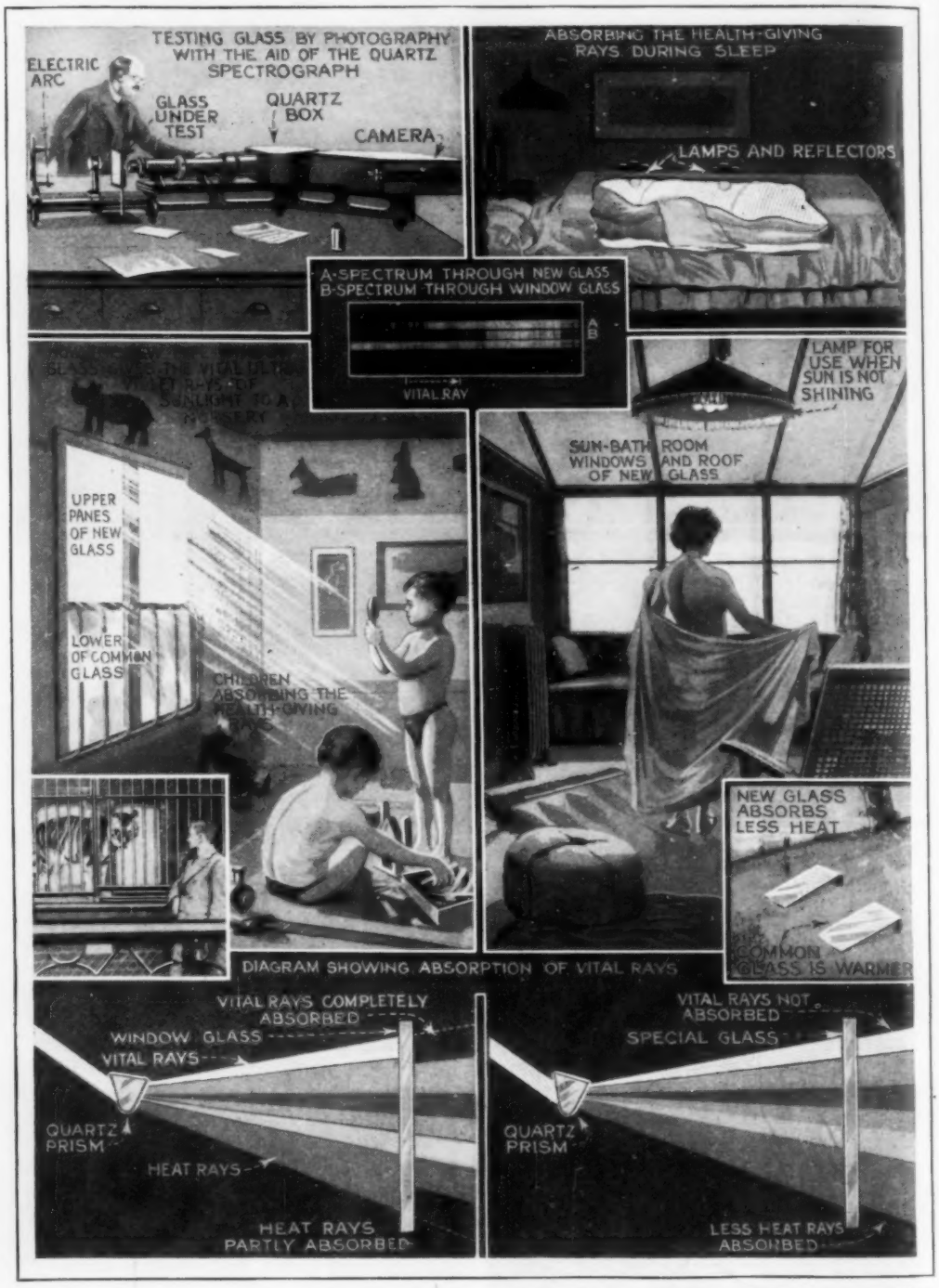
One of the General Motors subsidiaries, which has been using chromium plating on radiator shells and some other parts for a year, subjected a radiator to a constant bath of salt spray for more hours than would occur in the normal life of a car in a seaside town, without any trace of corrosion.

Chromium is impervious to all acids but two—hydrofluoric, the acid which even eats through glass, and nitric.

Besides its many other uses, chromium is at work printing money and postage stamps for Uncle Sam. Deposited on the casehardened steel engravings used in the bureau of printing and engraving, chromium has run for more than 150,000 impressions without showing any appreciable sign of wear, whereas the casehardened steel alone wore out after 50,000 prints had been made. Chromium-plated electrotypes used for such purposes as printing paper cartons, tags, cards, etc., have run for a considerably greater number of impressions without damage, than can be obtained from the ordinary nickel-plated electro. In New England textile mills chromium-plated steel is replacing other materials for printing delicate fabrics, giving longer life and finer work.

This wonder metal also will protect iron, steel and copper from scale. Several thousand electric-soldering-iron tips have been plated to prevent the breakdown which occurs near the base of the tip after constant heating. Even boiler tubes have been plated on the inside to prevent scale. The plating process differs with different plants. In an automobile factory the radiator shells are first plated with copper to fill the big pores, then with nickel to fill the copper pores, and finally with a "flash" or thin coat of chromium to fill the nickel pores. At the Vacuum Can plant the chromium is plated directly on steel, iron, both forged and cast, copper, brass and other metals. Surgical and dental instruments plated directly on steel show no difference from the same instruments plated over a nickel base, except that sometimes the nickel coat scales and affects the chromium.

NEW GLASS LETS HEALTH RAYS THROUGH WINDOW



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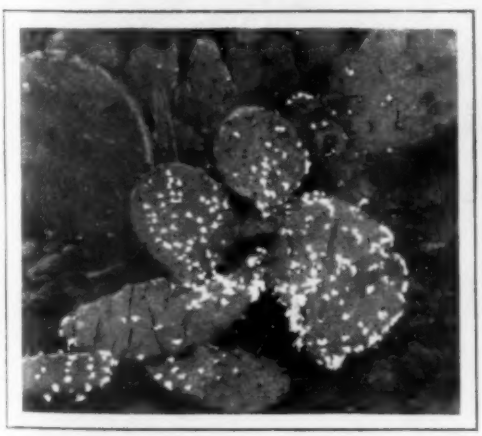
Passing Not Only the Health-Giving Ultraviolet Rays, But More of the Sun's Heat Too, a New Glass Produced in England Is Being Used Both in Homes and at the London Zoo

SUN'S RAYS TO HEAT BUILDINGS EXPERT PREDICTS

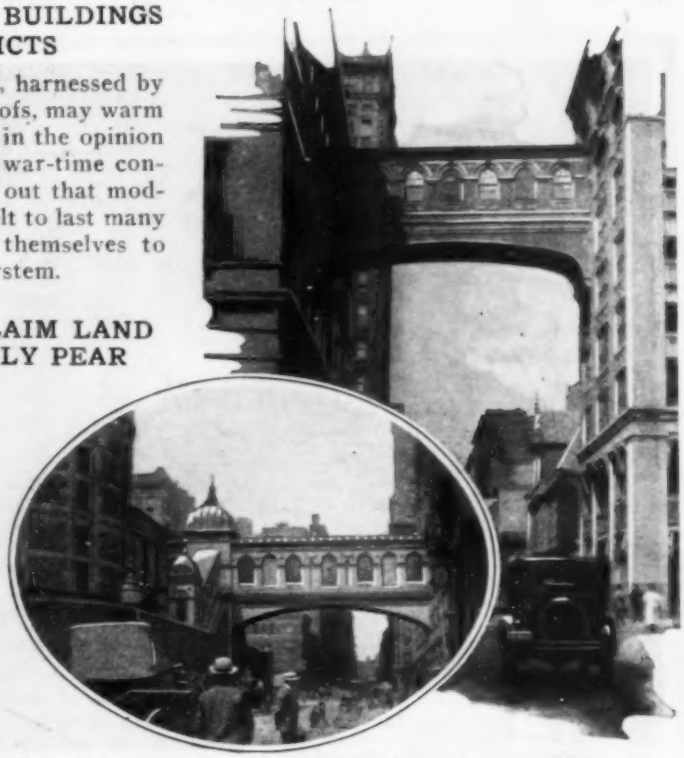
Heat from the sun's rays, harnessed by special equipment on the roofs, may warm big buildings in the future, in the opinion of Col. John R. Kilpatrick, war-time construction chief. He points out that modern structures are being built to last many years and that they lend themselves to the adaptation of such a system.

INSECTS HELP RECLAIM LAND BY KILLING PRICKLY PEAR

Farmers in Australia are looking to a lowly scale insect and a species of moth to help them save 25,000,000 acres of land from the prickly pear. More than $40,000 and five years have been spent by experts in finding these natural enemies to the pest plant, which has been spreading at the rate of 1,000,000 acres a year. Care had to be taken that the bugs were not injurious to desirable vegetation and that none of the enemies of the insects themselves would be introduced with them. After many experiments, three strains of the insect and the moth have been liberated to work their worst on the prickly pear, and hope is expressed that they will be victors.



Prickly-Pear Plant with Evidence of Ravages Worked by Insects Bred to Destroy It



Upper Photo Shows the "Bridge of Hope" to District Attorney's Office; Inset, the "Bridge of Sighs" to the Tombs

"BRIDGE OF HOPE" RIVALS "BRIDGE OF SIGHS"

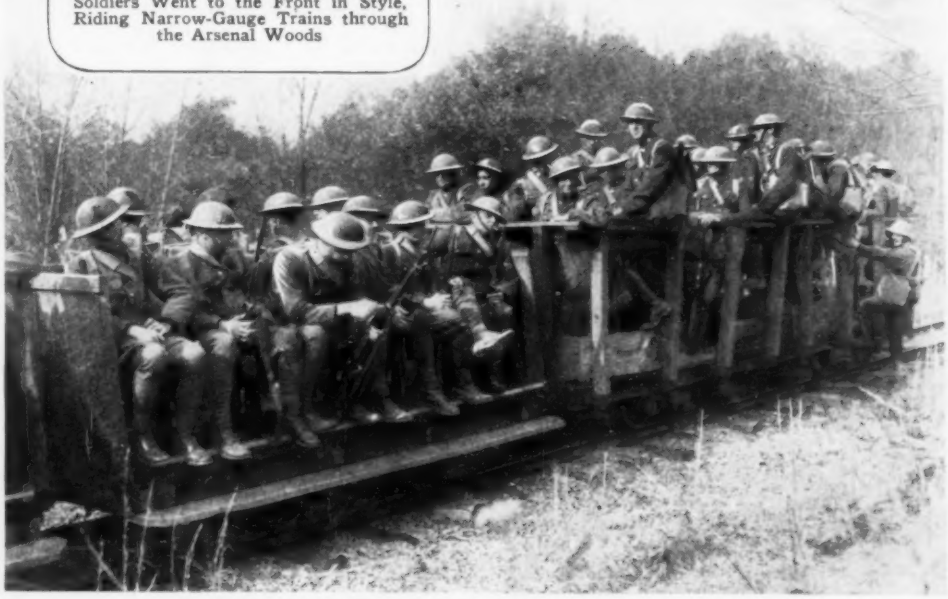
As a counterpart to the famous "Bridge of Sighs" in New York city, the passage leading across the street from the criminal-court building to the Tombs, a "Bridge of Hope" now presents a brighter side of the picture. It connects the court building and the district attorney's office where a fate much less depressing than a long prison sentence may await the culprit. Both bridges are similar in construction and design.

LICENSE TAGS FOR AIRPLANES LATEST U. S. RULING

Airplanes will be tagged and numbered like automobiles, according to a department of commerce ruling under the new aviation laws. A census showed that there were about 5,000 planes in operation over the country late last year. By the new regulations, no airplane can be flown until it has been licensed and tagged.

SHAM BATTLE TESTS LATEST CHEMICAL WEAPONS

Brilliant Night-Time Displays of Liquid Fire Featured Recent Sham Battle Maneuvers of Regulars at the Army's Great Gas Factory at Edgewood Arsenal; Phosphorus Bombs, Shot from Mortars, Trailed Long Streamers of Fire across the Sky as They Plunged Down on "Enemy" Trenches; the Soldiers Went to the Front in Style, Riding Narrow-Gauge Trains through the Arsenal Woods



BAY HORSE THE ONLY SURVIVOR OF CUSTER BATTLE

Details of the Custer battle with the Sioux Indians at the Little Big Horn were reviewed recently when a question arose as to the color of the horse that was the only survivor of the massacre. For several years, the mounted hide of "Comanche," a big bay, has stood in a glass case in the Dyche museum at the University of Kansas, as that of the steed ridden by Capt. Myles W. Keogh whose horse was the only living thing found on the battlefield. In a recent story of the fight, Capt. Keogh's mount was referred to as a "big, powerful gray." Museum records were consulted, with the result that the authenticity of its possession seems to be established and there is little doubt that "Comanche" was a bay. The best evidence is seen in a history of the horse sent to the museum by John C. Lockwood, adjutant of the national Indian war veterans, and one of the two men who found "Comanche" on the battlefield after the Custer massacre. Lockwood describes how he and James Severs carried water in their hats to revive the horse, which was removed, suffering from several wounds, out of a pile of bodies. It died of old age several years later, at Ft. Riley, the historian states, and its hide was mounted and placed on exhibition in the museum at the University of Kansas.

AERIAL LIFEBOAT IS PROPOSED FOR CHANNEL RESCUES

To go to the aid of victims of airplane accidents in crossing the English channel, a swift seaplane equipped with life-saving apparatus has been planned. It would be stationed on the English side of the passage and communication by wireless would be maintained with planes in flight. It is pointed out that the aerial lifeboat could arrive at the scene of disaster much quicker than a steamer.

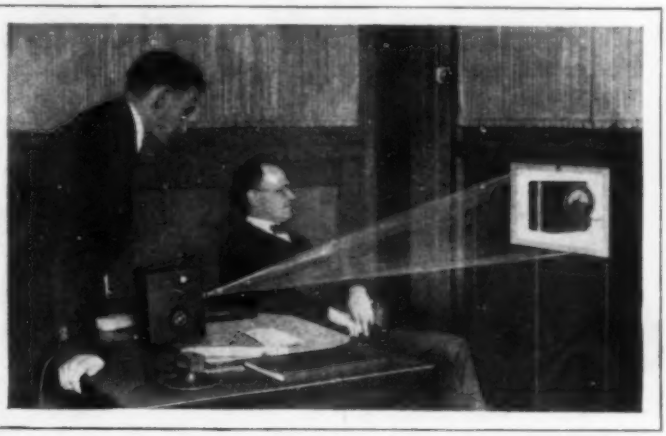
Demonstrating the Combination Powder Box and Horn Button; the Lid Snaps Tightly Shut

VANITY CASE ON AUTO WHEEL SERVES AS HORN BUTTON

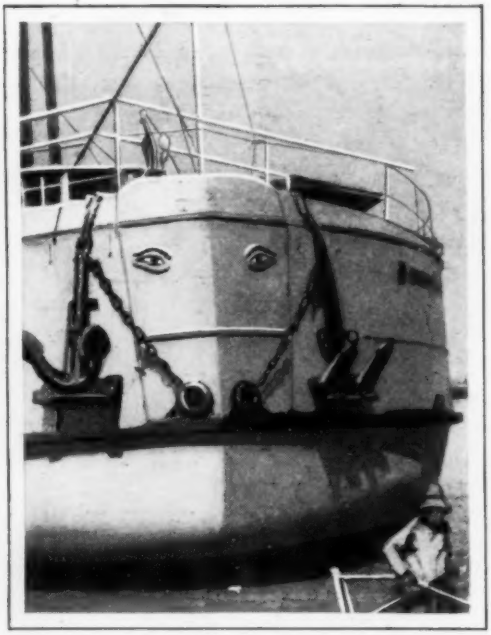
For the woman auto driver, a powder box with puff is fixed to the top of the steering wheel. When closed it serves as a button to sound the horn.

MAGIC LANTERN FOR SALESMEN HELPS SELL PRODUCT

For the special use of salesmen in displaying their goods, a lantern projector operated from a light socket, shows pictures, charts and diagrams for the inspection of prospective customers. A plain wall or piece of paper may be used as the screen and an ordinary electric bulb supplies the light for projection.



Salesman Displaying Pictures of Goods from Projection Lantern, Which Saves Carrying Catalog and Emphasizes Good Points of Merchandise



To Protect the Ship from Evil Spirits; Eyes on Prow of Chinese Vessel

EYES PAINTED ON CHINESE SHIP TO PREVENT WRECKS

According to a Chinese superstition, a vessel must see in order to avoid wrecks, consequently eyes were painted on the prow of the ship shown here, producing an odd effect. The belief is in line with the feeling that prompted the early adoption of figureheads. They were supposed to be guardians of safety, capable of pacifying the angry gods of the seas and averting danger from other malicious spirits.

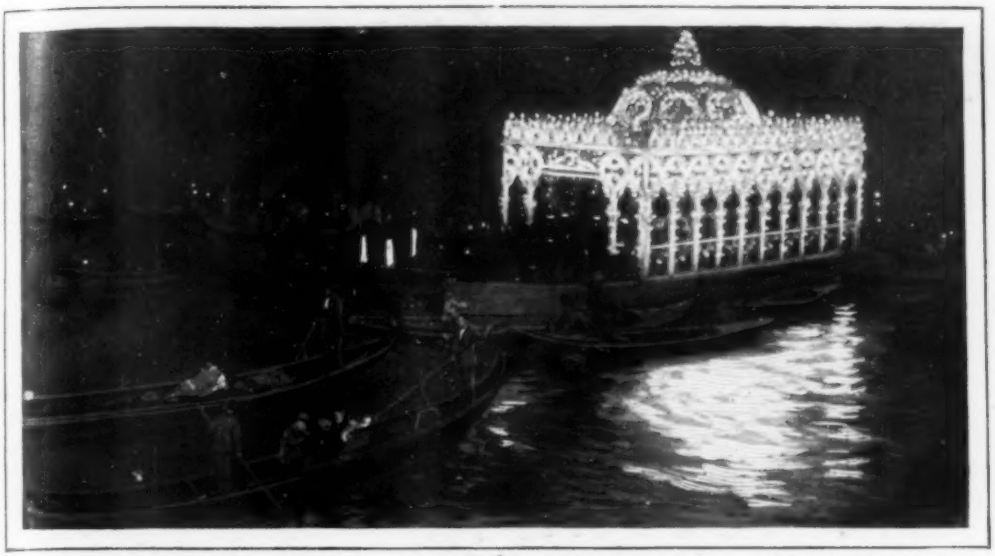
COAST CITIES TO FIGHT ANTS BY BUILDING CODES

Ravages of white ants in some cities of the Pacific coast have led to proposals for provisions in the building codes to combat the insects. One clause specifies insulation of all untreated woodwork from contact with the ground and application of proper chemicals to other timbers. The report from one city that fifty per cent of its business buildings had been seriously damaged by ants during the last year emphasizes the seriousness of the situation.

STEEL ROOFS MADE FOR WAR SERVE AS GARAGES

Hoods of half-inch steel, made to resist shell fire, have been adapted to peace-time service as garages at the government plant-testing farm in Virginia. They are easily erected, keep out storms and cold and are of convenient size for one car. At the farm, experiments are conducted with new plants, flowers, soils and fertilizers. Road materials are also tested, and an interesting side issue is the search, made in co-operation with golf experts, for turf and grasses that will provide the best greens for the courses.

Intended for Bomb-Proof Shelters but Adapted to Garages for Government Automobiles; Steel Roofs Arranged to Harbor Cars at the Plant-Testing Farm in Virginia



Electric Lights Lend Glamor to a Water Fete in Venice; the Glowing Gondola Palace Outlined in Brilliant Colors for the Parade

LIGHTED CANOPY ON GONDOLA FEATURE OF CARNIVAL

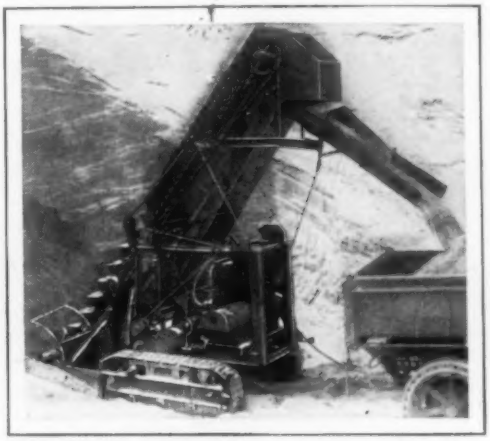
One of the high lights in a recent water carnival in Venice was a brilliantly illuminated gondola in a parade along the canals. An arched canopy and dome studded with many electric lights gave the effect of a moving palace.

TREES WRITE THEIR DIARIES WITH GROWTH RECORDER

A score or more of trees in the United States today have their pens in hand, so to speak, and are writing their own diaries with an accuracy that leaves nothing to memory. This is the interesting revelation of Dr. D. T. MacDougal, who explains that the "pen" consists of an instrument which records the growth behavior of a tree in relation to changes in the outside world. "With this writing equipment," Dr. MacDougal says, "a tree is able to tell us how its life is affected by rainfall, a series of humid days, a period of drought, or by seasonal conditions of any kind. Many trees of great interest and importance put on yearly layers of wood no thicker than a tenth of an inch, and some, after the first two or three centuries of their existence, add not much more than half of this amount to the wood each year." The dendrograph, as the instrument is called, is said to measure variations in diameter with greater precision than any other practical apparatus, and makes a continuous record.

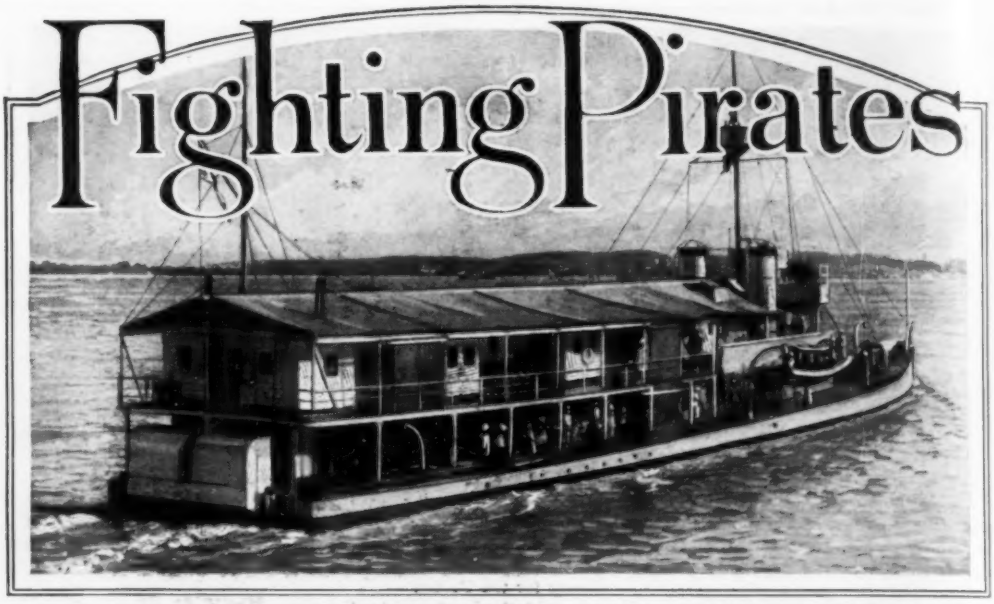
SELF-PROPELLING SAND LOADER SAVES HAND LABOR

Run by a twenty-horsepower motor, an endless-chain loader for sand, or other loose materials, can be moved about on its own treads. It can thus be easily set for the most efficient loading and does the work of several men in less time.



Sand Loader in Action; It Can Be Moved to New Position by Its Own Power

Fighting Pirates



River Gunboat on the Yangtze-Kiang; These Queer Craft, Built in China for Their Special Work, Have All Quarters above Deck Because of the Shallow Draft Necessary

Army, Navy and Marines in Far East Continually Engaged with Rebels, Bandits and Pirate Ships of the Yellow Sea

FIGHTING pirates and bandits is the regular job of picked army and navy units in the Far East—the only spot where enlisted men are sure of getting almost continuous action. Pirates swarm on the rivers of China and in the Yellow sea, while their land-going brothers, the native bandits, work up to the very walls of the biggest cities. To protect American lives and commerce, the American government, like all the principal powers, maintains large forces in China, where, under special treaties, they have power granted nowhere else in the world.

Piracy, as practiced in the Far East, has become modernized since the advent of steamships. In the old days, the pirate junks overtook the slow-sailing ships, boarded them, killed the crews in bloody fights and transferred the cargoes to the native vessels. But a sailing junk can't overhaul a fast steamer, so, nowadays, the pirates take passage as ordinary coolies, and at a favorable moment seize the ship. Then the junks come alongside to transfer the loot.

But the attack isn't always a success. Recently forty pirates seized a British steamer only eighty miles from Hongkong, the great British concession, but during the night two of the captured ship's officers got loose, obtained revolvers, and without help killed twelve pirates, drowned another and captured nine, the rest fleeing in the ship's lifeboats.

About the same time American and British gunboats were attacked a thousand miles up the Yangtze by Chinese rebel armies, virtually bandits. The rebels had seized several British and American ships, and when the gunboats went to the rescue attacked them, too, killing a half dozen English sailors.

The naval forces, however, shelled a few rebel camps and succeeded in recovering the captured ships.

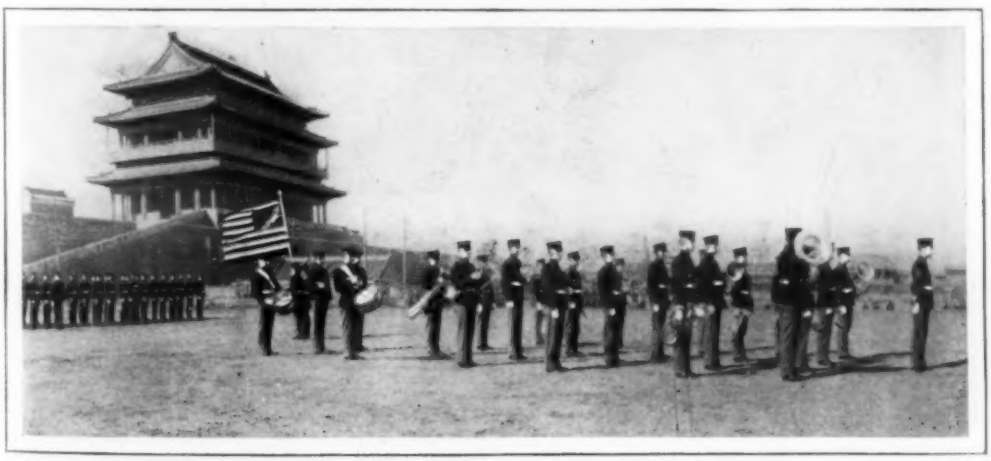
Since long before the Boxer rebellion, the army, navy and marine corps have maintained forces in China, engaged in the triple task of guarding the legation at Peking—a marine-corps assignment—protecting American settlements in Tientsin and other cities, keeping the Peking-Mukden railroad open to traffic—a job for the army—and guarding commerce on the Yangtze-kiang, a task which the navy

in CHINA

handles with a fleet of seven specially built gunboats. In addition, the Asiatic squadron at sea patrols the ocean highways to guard against pirate attacks.

It was one of the seven river gunboats that was attacked when it joined the British fleet in freeing the captured steamers on the Yangtze. The gunboat navies maintained by all the leading powers on this river are specially designed craft for shallow-river work. With their powerful engines they can invade the famous gorge—a cleft which in places has walls 13,000 feet high—and force their way upstream against the ten-knot current. The path of the river through the gorge is so steep that boats going upstream actually climb 500 feet in 350 miles, and that without a single lock.

Because of their shallow draft, the gunboats are useless at sea, and hence must be built in China. The seven American craft are the only vessels in the navy built outside American yards, and they also have the distinction of being the only



Marines of the Peking Legation Guard Drilling Beside the Great Wall of the City; the Legation Guard Stood Off the Boxers for Months While Awaiting Relief from Outside

ships carrying their name plates painted in a foreign language, Chinese picture characters being used.

The territory covered by the river fleets stretches from Hankow, 640 miles above the river mouth, upstream for several hundred miles. Below Hankow, the river is navigable for ocean ships, and this stretch is patrolled by destroyers, cruisers and a battleship or two, part of the Asiatic fleet. They also sweep the coast line on constant watch for the pirates of Formosa, who miss no chance to attack and loot both native and foreign vessels. The pirates, who formerly operated from their unwieldy junks, with slatting sails of bamboo and matting, have modernized their methods and now operate with all the efficiency and organization of a band of gunmen.

Their favorite method in recent years has been to take passage on a coasting steamer as ordinary travelers, and, when safely out at sea, seize the ship, loot passengers and crew, transfer any valuables from the cargo to waiting junks, and then disappear, occasionally carrying off a few passengers to be held for ransom.

Assignment to the Asiatic station, either of the navy or in the marine corps and army detachments ashore, is eagerly sought, not only because of the promise of active service, but for several other reasons. An army recruiting officer, describing the Chinese service, says:

"Think of soldiering where every dollar is worth two, where all fatigue duty is done by proxy, and where every fighting man has a valet to care for him and his equipment! From the four million men who wore the olive-drab uniform of the United States army eight years ago, such a statement would call forth scornful laughter and soul-felt sentiment given in no uncertain terms.

"Yet, far from being the idle imaginings of some idealistic-minded soldier, this condition actually exists. In Tientsin, at the gates of the mysterious Orient, two full battalions of the Fifteenth Infantry are stationed, and the 700 men of the American forces in China consider themselves as near paradise as any soldier can reasonably expect to get.

"Nor is this all. In China one never hears tales of hardtack, corn-willies or goldfish—those delicacies so familiar to the A.E.F. Instead, the China contingent finds the mess tables loaded with chicken and steak, turkey and venison, and numerous other luxuries. In one month Company I of the Fifteenth Infantry, consumed, exclusive of Sunday and holiday meals, 5,500 eggs and 500 pounds of chicken. Another company claims its men ate an even thousand eggs one morning for breakfast, in addition to other dishes! And beans are practically unknown."

The Fifteenth first went to China in 1900 to help put down the Boxer rebellion, and

American Sailors in a Machine-Gun Nest Guarding the American Section at Hankow; the Man on the Right Is Holding the Loop Aerial of a Portable Wireless Set

Japanese Soldiers Watching the American Rifle Team Win the International Championship of China, One of the Features in Which All the Foreign Troops Engage

was ordered back in 1912, when bandits again threatened foreign lives. It has been there ever since, with the exception of one battalion maintained in the Philippines. No soldier does any fatigue duty, for he can hire a native to do it for him at a salary of seventy-five cents a month. About all the troopers have left to do is drill and target practice, to which the mornings are devoted, while, following the universal custom of the white man in the Orient, the afternoons are given to rest and recreation.

With troops of several countries stationed in Tientsin, there is keen international rivalry, both in drills and on the target range. In the last international match, the team from the American regiment defeated the picked marksmen of the Japanese, British and French Garrisons, winning high praise from Lieut. Gen. Takada, of the Imperial Japanese army, under whose auspices the match was held.

The life of the marine guards at the American legation in Peking is much the same. All the forces maintain baseball, football and basketball teams, while polo is popular with the officers, who play teams from the other foreign detachments.

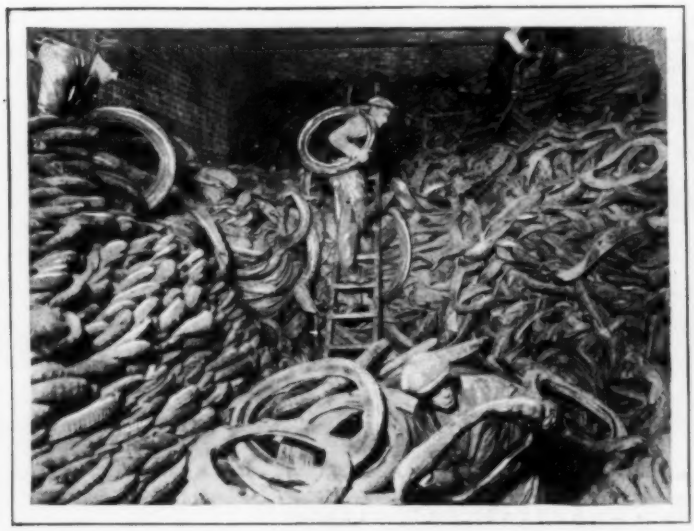
TOOTH MILLION YEARS OLD FOUND IN COAL MINE

That man appeared early in the age of mammals is indicated by the discovery of a fossil human tooth in a coal mine, near Billings, Mont. From the character of the deposits in which it was found, it apparently had been laid down more than 1,000,000 years ago. Dentists declared that the tooth had been the second lower molar of a human being.

HORN IS CONNECTED TO VIOLIN TO AMPLIFY TONE

Fitted with an amplifying horn, a violin is said to be equal to five ordinary instruments in an orchestra. Besides increasing the volume, the attachment is reported to develop the quality and beauty of the tones. The horn is supported over the player's right shoulder and does not interfere with the use of the bow.

To Increase the Power of the Violin's Voice; Amplifying Horn Connected to Instrument at Rear Rests on the Player's Shoulder



Picking Out a Few of the Best Ones from a Mammoth Salvage Pile of Old Automobile Tires in London

RECLAIM CAST-OFF AUTO TIRES FOR CANVAS AND RUBBER

Useless for further road service, many discarded automobile tires yield marketable rubber and canvas to the junk men. Some handle little else but worn tires and tubes. The salvaged product appears in the form of mats, packing, shoe soles and other materials. Much of it is used in roofing. Tire-reclaiming is a considerable industry in England, where millions of tubes and casings are junked annually.

CAMERA TO SOLVE MYSTERIES OF OLD TEMPLE

How the camera is being used to save for posterity the records of some of the most interesting chapters in human history, is illustrated in the "inscription salvage" being done on the walls of ancient temples along the Nile. From the original pictures and symbols on the crumbling stones, the photographer makes small negatives, section by section. Enlargements and tracings from the negatives are then taken to the temple and, while the worker balances himself on ladder or scaffold, he "proofreads" the copy directly from the original. It is estimated that two or three more years will be needed to complete and publish the records from the Medinet Habu temple, at Luxor, alone.

GARDEN IN FORM OF U. S. MAP NOVEL PARK FEATURE

Flowers and shrubs were sent from forty-nine cities throughout the country

The United States Map Garden in Miami, Fla., Park; It Is Planted with Flowers and Shrubs Sent from Forty-Nine Cities

A City Pauses for a Backward Glance; Replica of a Dutch Farmhouse on the Canopy of the Hotel Astor, New York, Erected for Broadway Anniversary Observances

for planting in a unique garden in a Miami, Fla., park. The plot is lined out to represent the states of the Union and, when in blossom, will constitute a flowering map of the nation. The plants were set by former residents of the states represented.

SPREADER TIP ON GLUE TUBE PROTECTS FINGERS

Glue is easily applied from a tube, without soiling the fingers, through a spreader tip of rubber. It is shaped to simplify even distribution of the adhesive which is forced through a small hole in the cap. The aperture is self-sealing so that it is not necessary to screw on an extra top. Squeezing the tube opens the hole when the glue is to be used again.

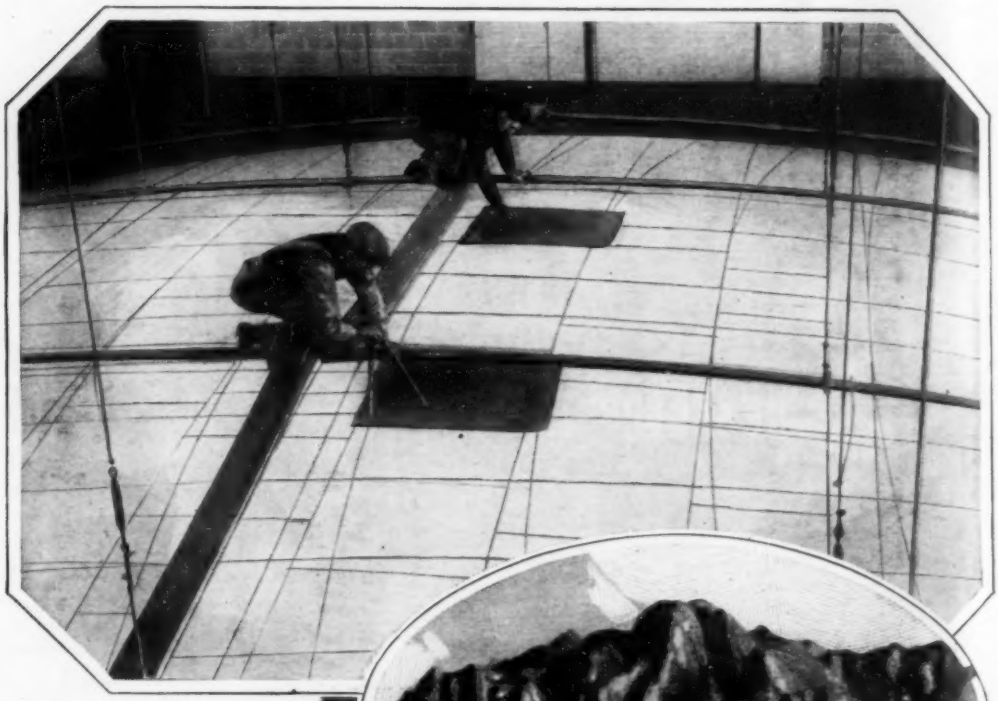
MODEL HOME ON HOTEL CANOPY SHOWS CITY'S GROWTH

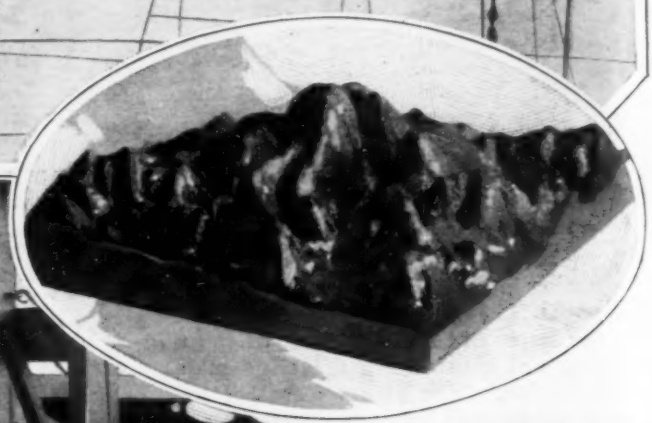
One of the features of the anniversary celebration in commemoration of the beginnings of Broadway, was the display of a model house on the canopy of the Hotel Astor. It was a replica of Heinrick Eden's Dutch home that stood on the site of the hotel in the early days, when he owned a large block of property near by. The contrast between the modest dwelling and the huge hotel, forcibly illustrated the city's growth of a century.

FILAMENTS OF RARE METAL TO IMPROVE LIGHTS

Not content with the improvement in the incandescent electric lamp through using drawn wire filaments of tungsten instead of carbon, investigators are experimenting with molybdenum for this purpose. The metal withstands extremely high temperatures, is malleable, and can be forged while hot and worked into rods.

GREATEST RELIEF MAP IS SIXTY-THREE FEET WIDE





At Work on Section of Map of U. S. and Canada; It Is Curved to Conform to Shape of the Earth and the Plots Are Molded Separately; Right, a Block of Mountainous Territory Showing Detailed Modeling; the Finished Map Will Cover 3,000 Square Feet, at a Scale of About Four Inches to the Mile

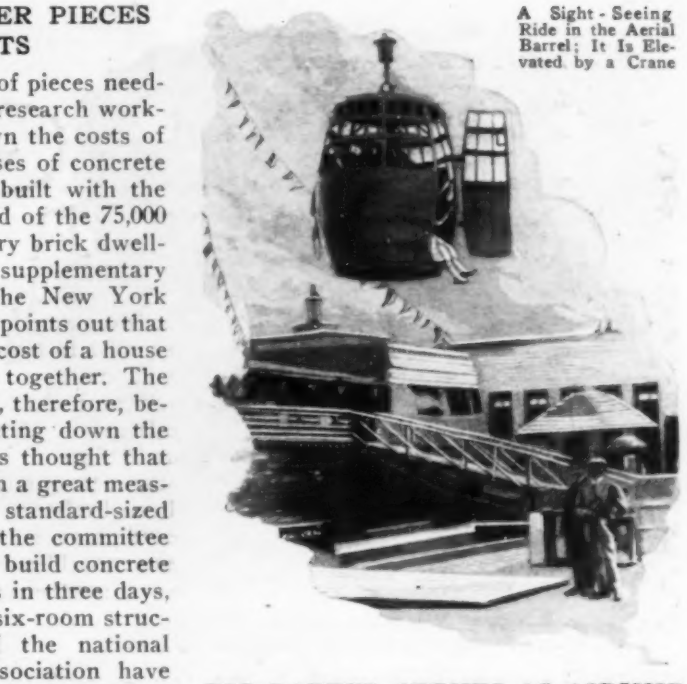
Cutting Block on Jigsaw; More Than Twenty Men Are Working on Map

HOUSES WITH FEWER PIECES TO CUT COSTS

By reducing the number of pieces needed in building a residence, research workers see a way to bring down the costs of construction. Sample houses of concrete blocks already have been built with the units reduced to 100 instead of the 75,000 that are used in the ordinary brick dwelling, when all the units of supplementary materials are counted. The New York tenement-house committee points out that sixty-three per cent of the cost of a house goes into putting the parts together. The hope of cheaper housing is, therefore, believed to lie mainly in cutting down the labor thus expended. It is thought that this can be accomplished, in a great measure, by using larger and standard-sized units. Some officials of the committee hold that it is possible to build concrete houses of these large units in three days, using but 100 pieces for a six-room structure. Representatives of the national lumber manufacturers' association have expressed the belief that frame houses can be planned with even fewer than 100 pieces to the house.

SAFETY REPAIR LIFT FOR AUTO SAVES ROOM

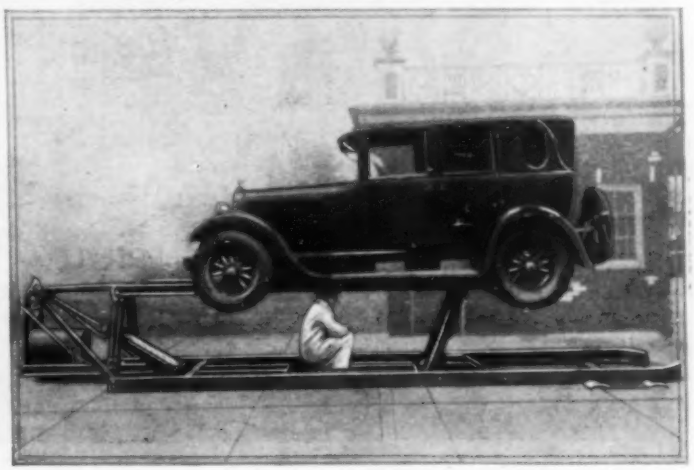
For use inside or outside the service station, an automobile lift requires less space than the usual rack and eliminates the task of driving the car up an incline and climbing down. It functions by oil pressure in a heavy cylinder, a motor-driven pump affording the power, and the car is elevated by the front and rear axles, leaving the wheels free. Space under the auto is unobstructed, allowing the mechanic access to all parts. An additional feature is that installation expense is saved. The lifting and lowering operations are smooth, steady and rapid, the manufacturers claim, and it is impossible to drop the car accidentally.



A Sight-Seeing Ride in the Aerial Barrel; It Is Elevated by a Crane

BIG BARREL SERVES AS AIRSHIP AT AMUSEMENT RESORT

Visitors at an amusement park in Basel, Switzerland, are able to get a bird's-eye view of the grounds and surrounding country while riding in a big barrel that is lifted and swung about on a crane. The upper part of the cask's staves have been cut away so that the occupants can look out and a door permits entrance or exit.



Repair Lift Raised, Showing How Wheels Are Left Free and Worker Has Unobstructed Space Underneath

The

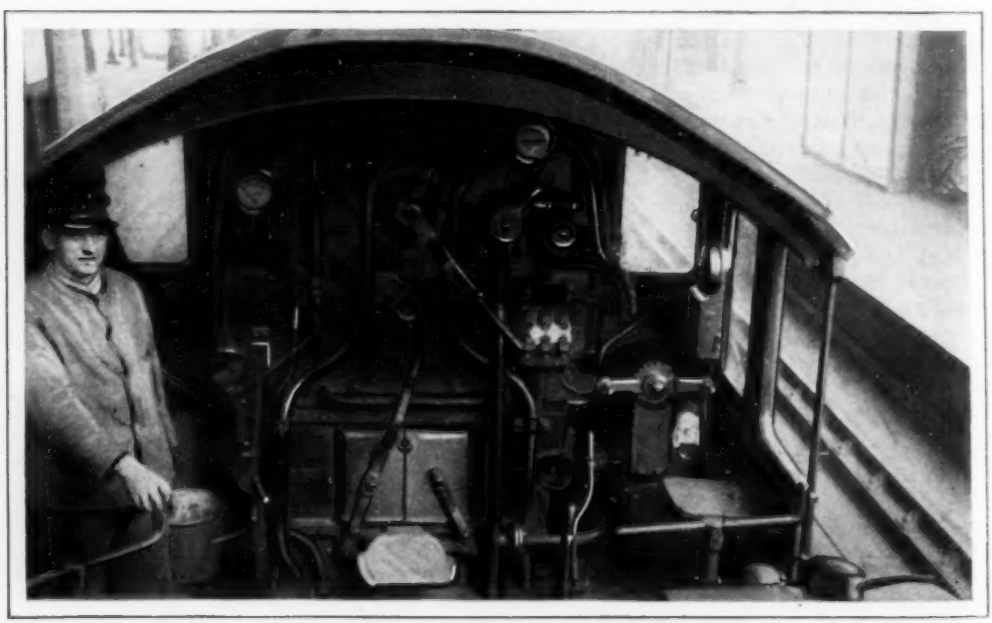
By JOHN

The Twentieth Century Limited, Running between New York and Chicago, Is the World's Fastest Long-Distance Train, Covering 976 Miles

RIDING on one of the world's fastest trains is no easy job, if you are up in front in the locomotive, because you cannot sit down for a minute.

Although American railways are known for their efficiency, the fastest passenger run in the world is made on the Great Western railway in England, from Swinton to Paddington station, London, seventy-seven and a quarter miles in seventy-five minutes at the rate of 61.8 miles an hour. Another train on the same road, the Cornish Riviera express, makes the 226 miles to Plymouth at the rate of 54.8 miles an hour. This is a non-stop run, during which sections of the train are cut off while it is going at full speed—a thrilling operation.

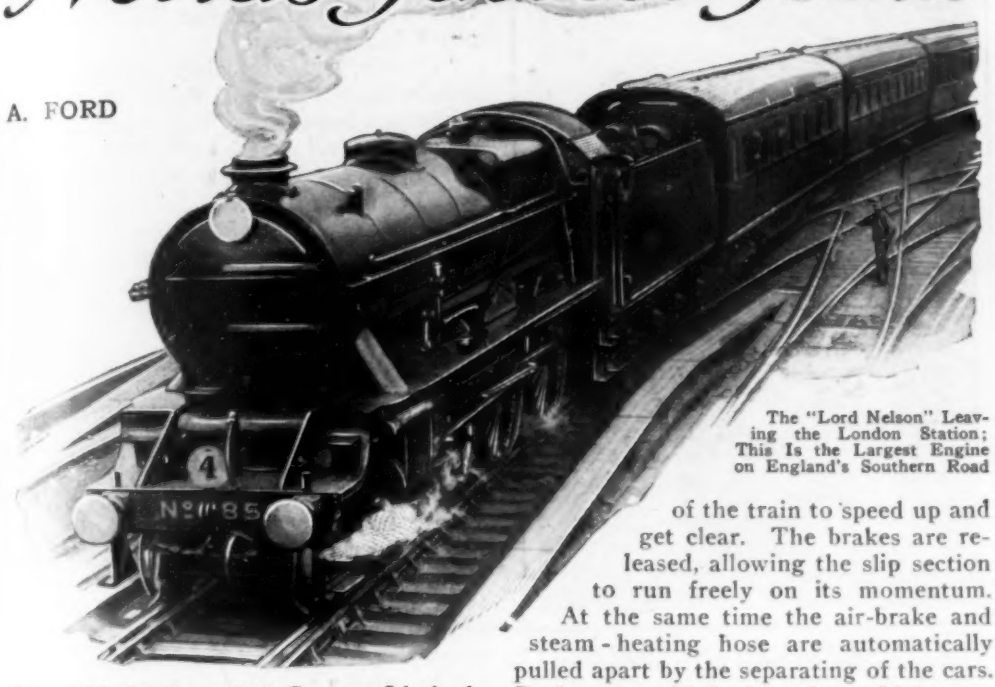
America, however, holds the honor of having the fastest long-distance train in



Interior of the Engine Cab of the "Lord Nelson," Which Hauls One of England's Fastest Trains, the Atlantic Express, Running from Waterloo Station to Devonshire

World's Fastest Train

A. FORD



The "Lord Nelson" Leaving the London Station; This Is the Largest Engine on England's Southern Road

the world, the Twentieth Century Limited, which makes the run of 976 miles between New York and Chicago in twenty hours at the rate of 48.8 miles an hour.

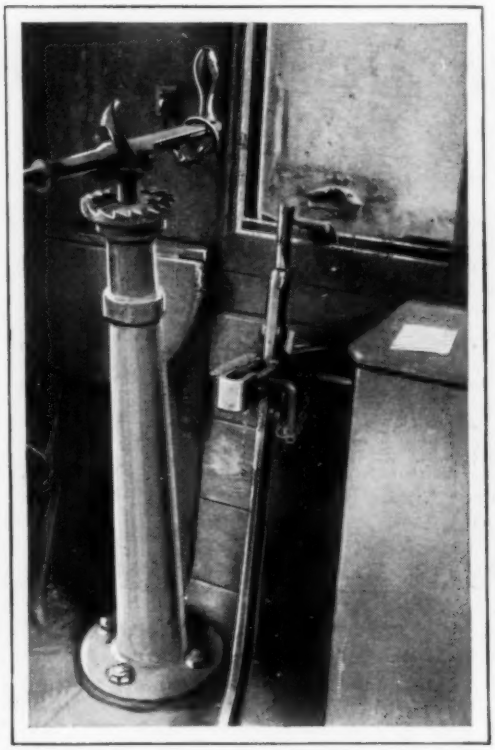
The fastest mile ever made on any railway, at any time, was recorded by the famous locomotive No. 999 of the New York Central on May 10, 1893. On a tangent, slightly downgrade, the speed was 112.5 miles an hour.

The Cornish Riviera express cuts off, or "slips," cars at three stations. In each case the "slipping" is done while traveling at high speed. The moment the engineer signals with his whistle and slackens the train, the guard in the section to be cut off pulls a lever which opens the coupling device, slips the car or cars and sets the air brakes. It only remains for the front part of the train to speed up and get clear. The brakes are released, allowing the slip section to run freely on its momentum. At the same time the air-brake and steam-heating hose are automatically pulled apart by the separating of the cars. Both are provided with valves which automatically close the exposed ends when the connections have been severed.

On the day I made a trip on this train two cars were to be slipped at Westbury, ninety-five miles from London, while the train was moving at a speed of about eighty miles an hour. Exactly on the dot, the express, composed of half a dozen coaches, started so noiselessly and so smoothly that I would not have known we were moving had I not been looking out of the window. But if the beginning was smooth and noiseless, the rate of acceleration was swift. The lightness of the English trains is a big factor in their quick get-away. Only a few rods outside the station we were moving at more than thirty miles an hour. As we approached

SOME OF AMERICA'S FASTEST TRAINS

			Miles	Speed
Number 1181	Penn.	Philadelphia-Atlantic City	60	55.4
Number 17	Reading	Philadelphia-Atlantic City	60	55.4
Twentieth Century Limited	N. Y. C.	Chicago-New York	976	48.8
Broadway Limited	Penn.	New York-Chicago	908	45.4
Southwestern Limited	N. Y. C.-Big Four	New York-St. Louis	1,157	44.1
Washingtonian	B. & O.	Philadelphia-Washington	133	43.6



Vertical Lever, Right, in Guard's Compartment, Disconnects the Car and Drops It Off at Its Station

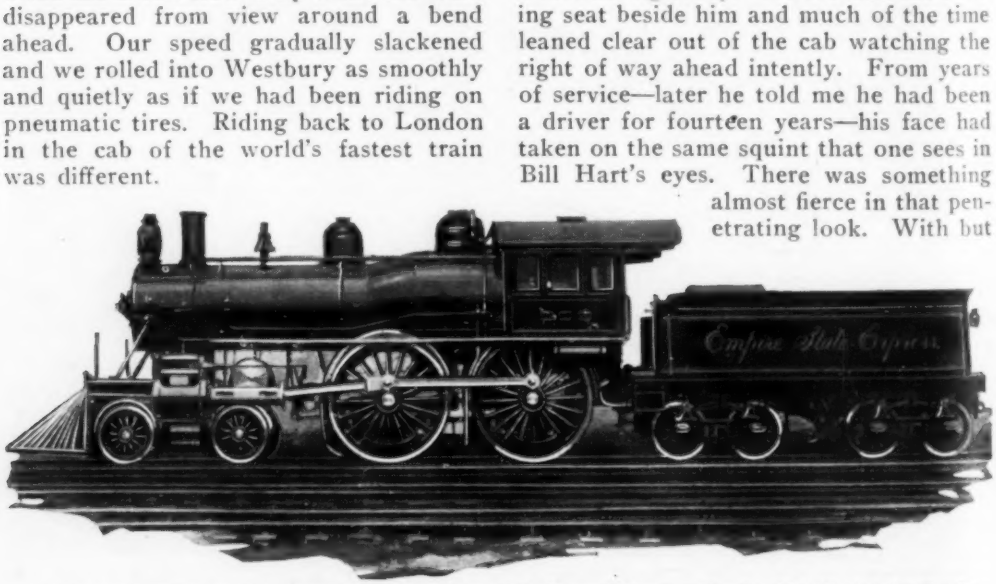
Westbury, the engine gave a shrill whistle and I felt the train slacken for an instant. Then the coach slowed up while the train disappeared from view around a bend ahead. Our speed gradually slackened and we rolled into Westbury as smoothly and quietly as if we had been riding on pneumatic tires. Riding back to London in the cab of the world's fastest train was different.

"Better stand over there by the fireman's window," the driver said when I showed him my special pass. I obeyed and began to get acquainted with the details of a speed monster different from any I had ever seen.

"Charlie," said the driver glancing at his watch, "better take a drink of this tea while you have time. You won't get another chance." And with that he held out to the fireman a steaming cup which had been resting on the vibrating iron shelf just above the fire door.

Charlie dropped his shovel for an instant and took the white cup in his blackened hand. The engineer looked back toward the station and I heard the guard's "go ahead" whistle. The brawny hand of the driver was on the "regulator handle" gradually giving the monster steam. Imperceptibly we began to move. Notch by notch he opened it wider until the whole frame of the speed machine swayed from side to side. To avoid getting in the way of the fireman, whose shoveling was almost continuous for the next hour and fifteen minutes, and to prevent being thrown against hot steam pipes, I kept hold of a brass pipe and spread my feet apart.

The rumble and roar of the engine and train was incessant now that we were under full steam. The engineer's face was a fascinating study. He scorned the folding seat beside him and much of the time leaned clear out of the cab watching the right of way ahead intently. From years of service—later he told me he had been a driver for fourteen years—his face had taken on the same squint that one sees in Bill Hart's eyes. There was something almost fierce in that penetrating look. With but



The Fastest Locomotive That Ever Traveled, the New York Central's Famous Number 999, Hauled the Empire State Express May 10, 1893, at a Speed of 112.5 Miles an Hour

Cannon Street Depot, in London, Which Has Been Electrified, Handles So Many Suburban Trains That, during Rush Hours, One Leaves the Station Every Half Minute

two or three exceptions his hand never left the regulator handle. With a grimy cap pulled well down on his forehead and with his head thrust slightly forward, he forced his locomotive at well-nigh top speed through town and countryside. Now and again he would glance at the steam gauge whose needle quivered incessantly at the red line marked "225." Once or twice in the long wild run he turned to see if Charlie was feeding the iron monster all it could hold.

The towns lie close together in England, especially within a radius of seventy-five miles of London, and they are towns with manufacturing plants, fine railway stations and many other things which mean intricate rail systems. Had I not been prepared for it, the speed with which we roared through these places would have taken my breath away. Gazing at the maze of tracks into which we plunged again and again without slackening speed so much as a hair, I half wondered if we would go crashing into buildings or rolling stock. But always the signals spelt safety and always the vibrating iron horse found a clear path without a second's hesitation.

As the minutes passed and I stood watching the shining rails ahead, I came to understand more fully one great advantage which British trainmen have over American crews. The American engineer is tortured with the haunting fear that he is going to kill some one. In England that possibility is almost wholly removed. The rights of way are without trespassers, and with but few exceptions there are no grade crossings. The highways in England go over or under the railway tracks. In the few instances where there were grade crossings, high gates were provided. These gates always stand across the highways except when traffic is passing, and when the gates are opened for motor cars or wagons, they are swung across the railway. In England trespassing on railway property is an offense that is quite apt to land one in jail.

At last we were in the outskirts of London, and the buildings became more numerous, yards and gardens grew smaller and less frequent, and street traffic grew more dense. But our driver never slowed up except on one or two occasions. Then the big lever was moved from its position only for a few seconds, after which the shrill whistle was sounded more frequently, often beginning 200 yards before we reached a depot and continuing until we had entirely passed the station platform.

Exhibiting Grotesque Mask Molded for Unique Crafts Display in Los Angeles School

GRADE PUPILS MODEL MASKS FOR SCHOOL EXHIBIT

Grammar-school pupils of Los Angeles recently demonstrated their skill as stage craftsmen in an exhibit of miniature scenic sets, masks and other theater equipment. Models of animals from the nursery rhymes, and small boats were also shown.

SLING-SHOT DRILL FOR CADETS IMPROVES MARKSMANSHIP

Cadets at a British military school utilize the lowly sling shot to train their eyes and steady their nerves that marksmanship with guns may be improved. Shooting from difficult positions is often necessary and training is afforded by firing the "rubber guns" while lying on the back.

Sling-Shot Drill at British Military School

INQUEST OVER BROKEN RAILS KEEPS RAILROADS SAFE

Every time a steel rail breaks in service an elaborate investigation is instituted to fix the cause and the blame. The history of every length of rail in thousands of miles of service is kept on file, and if five per cent—from five to seven rails—break in any one batch of rails made from the same "heat" at the mill, all the rest are hunted down, removed from main-line service and relegated to switches, sidetracks and little used branches. The precautions used on the vast mileage of the Pennsylvania railroad system are typical of those common on all American roads. When a break is found, the foreman of the section gang fills out a report covering the complete history of the rail, and on printed outline drawings fills in three views of the break. The fifty-six questions which he must answer cover not only the name of the maker, the heat number and the date the rail was installed, but the hour of the break, whether a train had just passed or not, whether the break interrupted the electrical-signal system and set the stop signal to protect trains, the condition of cross ties, joint bars, ballast and even the kind of drainage near by. All that information passes through several inspectors' hands, and, if the facts warrant, the broken rail is shipped to the experimental laboratory at Altoona, Pa., for chemical, physical and microscopic tests. Modern 130-pound to the yard rails are expected to stand up under the passage of 200,000,000 gross tons before they are removed from main lines to less heavy duty. The ends are then cut off to remove the sections where the greatest wear has occurred, and the shortened rail is used for lighter traffic.

¶Blind persons in an Iowa city carry canes with a red glass disk at the top and when they want help in crossing a street, hold the stick horizontally to signal for aid; the plan has proved entirely successful.

MAKING OF A MONUMENT—FROM MODEL TO BRONZE

First Step after Completing Small Working Model; the Wood and Steel Framework

Shellac Is Next Applied; Then the "Armature" or Base Is Covered with Clay

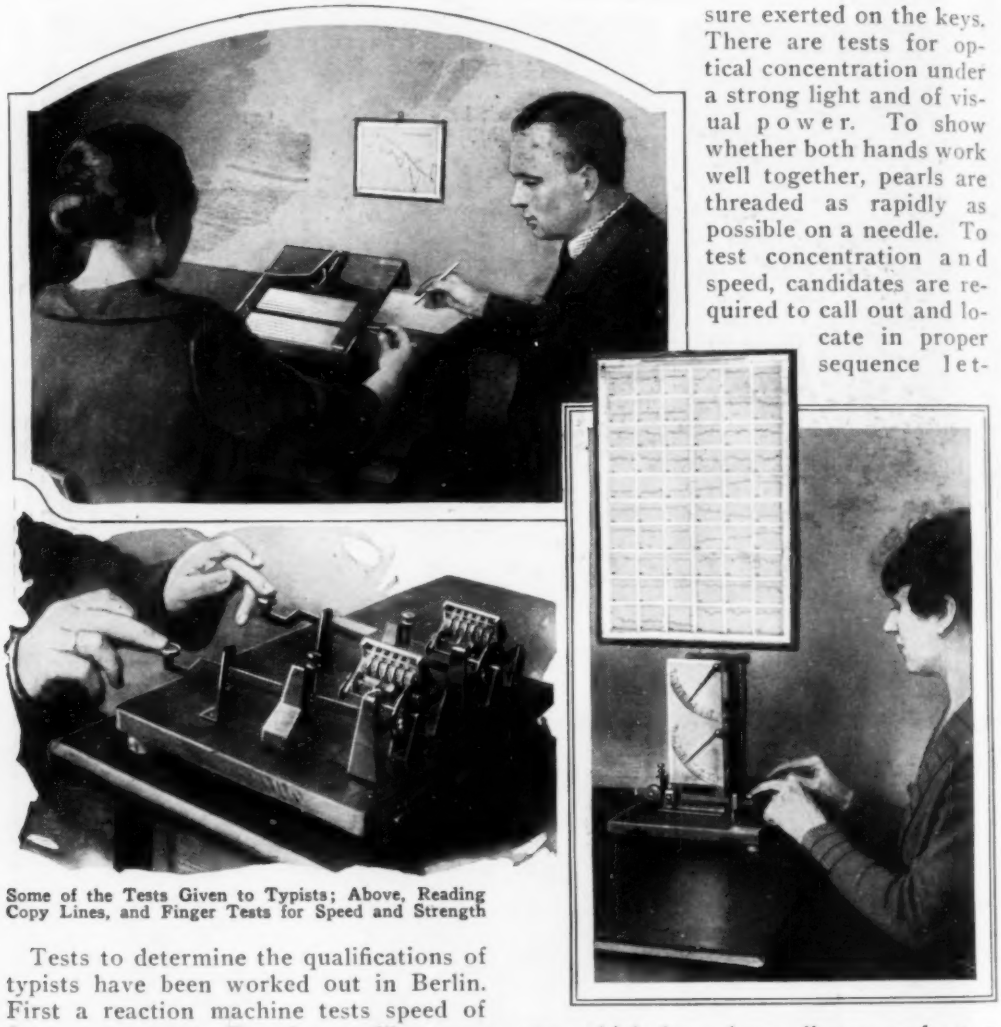
Upon Rough Clay Figure True Points of Small Model Are Made with Pantograph

Clay Is Then Covered with Plaster Which Is Strengthened with Iron Pipe

When Plaster Has Set, It Is Broken Off in Sections and Reassembled

The Bronze Is Made from the Plaster Model, and Is Then Smoothed and Polished

SKILL AT TYPEWRITING IS REVEALED BY MIND TESTS



Some of the Tests Given to Typists; Above, Reading Copy Lines, and Finger Tests for Speed and Strength

Tests to determine the qualifications of typists have been worked out in Berlin. First a reaction machine tests speed of finger movement. Two levers, like typewriter keys, are pressed as often as possible for one minute. An indicator counts the strokes and a balance records the pressure exerted on the keys. There are tests for optical concentration under a strong light and of visual power. To show whether both hands work well together, pearls are threaded as rapidly as possible on a needle. To test concentration and speed, candidates are required to call out and locate in proper sequence letters which have been disarranged on a calendar. Skill in hand work is shown by a test in taking out screws from a block of wood, using various-sized screwdrivers.

STUDY OF SHORE LINES TO TELL IF EARTH IS SINKING

Investigators have started a task that may take twenty-five years to finish, a careful measure of the shore lines along the Atlantic coast to determine if the North American continent is sinking. Some geologists believe that it is subsiding at the rate of one or two feet a century, and to find if this is true, hundreds of measurements are to be made with tide gauges in Jamaica Bay, Eastport, Me., and at St. John, N. B. The United States coast and geodetic surveys, New York city dock department and the Canadian government are expected to co-operate in the work. Plans have also been made for measuring the shore lines on the Pacific coast for the same purpose.

FIFTY-MILLION-DOLLAR LOOT BURIED ON PIRATE ISLE

There's fifty million dollars in doubloons, pieces of eight and treasure of the Spanish main waiting on a desolate island off the coast of Brazil for the person who can find them. This is the word of George Finlay Simmons, curator of the Cleveland museum of natural history, who spent two years in the south seas as commander of the steamer "Blossom," visiting three continents and bringing back a number of specimens for the museum's collection. The treasure is believed to lie where it was buried a century ago by two pirates who took it from the Inca Indians. One of the hoards, valued at $40,000,000, was captured by a Spanish rover, Jose Santos. It was taken from a ship loaded with gold and silver bars, altar vestments and candelabras from the churches of Peru. More than $8,000,000 additional was buried on the same island by an English pirate who called himself "Zulmiro." Records of the prize were kept and were in the possession of the Russian quartermaster of the ship until he died in the far east. Between 1800 and 1892, eight expeditions were made in search of the treasure. Some of them did not even reach the island. Those who did were foiled in their hunt when they found that landmarks on their maps had been obliterated by a slide.

EMERGENCY OVERSHOES FIT VANITY CASE

So small they fit into a box about the size of a vanity case, emergency overshoes are being made of light, transparent rubber. They roll on and off the shoe in a jiffy without bothering as to size or shape. The rubber is about the thickness of that in surgeons' gloves and bathing caps, does not damage the leather and may be worn inside the shoe as an additional protection for the feet against dampness. At present the rubbers are made in the natural color only, but later they will be supplied in various shades to match those of ladies' slippers.

Slipping On the Rubbers, and How They Look on the Shoes

Shadow of Penn Statue Cast on Low-Hanging Clouds by Powerful Searchlight

STATUE SHINES ON THE CLOUDS OVER SEARCHLIGHT

During the illumination of the William Penn statue on the tower of the city hall in Philadelphia, a weird effect was noticed when the shadow of the figure was seen on a bank of low-hanging clouds, giving the impression of a "spirit" or double view. Such occurrences are not particularly rare, but generally the light is not sufficiently strong to cast a shadow that can be photographed. In this case the powerful searchlight, shining from below, caused an unusually clear-cut shadow.

¶Cable insulation and hard-rubber compounds are being prepared from synthetic rubber that lacks elasticity.

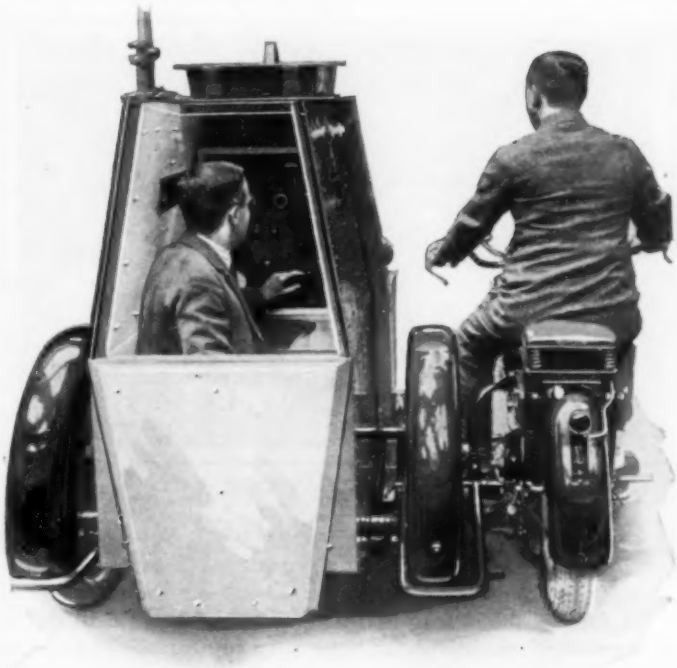
Guardian Dragon in Mandalay, Burma, with Two Natives Standing on Its Huge Claws; the Burmese Art Is Entirely Original, and Not Copied from Abroad

OIL WELLS DO NOT RUN STRAIGHT

Deep oil wells generally are not straight, but abound in twists and turns, the deflections in some cases running to hundreds of feet. A survey of a well in California showed that at a depth of 6,000 feet it was 517 feet out of plumb. A chart of some wells, it is said, would look more like a corkscrew than a straight line. Strata of different hardness and tilted layers, which make drills slide off at an angle instead of cutting straight down, are among the chief causes for these twists in the wells. A well may be started in the middle of a tract of land and end at the bottom under a different tract. Wells sometimes wander into each other with consequent damage and the possible ruination of a producer. Two wells started together may often vary widely instead of following parallel courses, thus complicating the task of drilling.

FISH KILLED TO SAVE SARDINES START NEW INDUSTRY

Hunting the tuna fish was formerly done to protect the sardines, which they devour in large numbers, but since the tuna is now popular for food, it is the basis of an important phase of the fishing industry. In the Mediterranean, the tuna are detected by watchmen who sit in chairs on high extension steel ladders on the coast and relay word by telephone when a school of the fish is sighted. By means of sardine bait, the fish are lured into a bay, called the "death chamber." This chamber is a square inclosure of heavy netting which is closed at the entrance when a number of fish have been caught in it. Then the men, working from a float around the net, kill the tunnies with spears.



Radio Sidecar for Police Work in Berlin; It Can Be Disconnected and Run on Own Power

ARMORED SIDECAR WITH RADIO AIDS IN POLICE WORK

Besides having a radio receiver, an armored motorcycle sidecar, introduced in Berlin, can be detached and run on its own power. The protected top of the car is built high enough to afford room for the operator inside and slants abruptly in order to deflect bullets.

DETACHABLE BILLIARD-CUE TIP AIDS ACCURATE PLAYING

Caps for billiard cues are made detachable by means of a threaded-sleeve device

a western inventor has introduced, so that they may be removed and laid away where they will not be damaged after the game. The tip is held securely to the threaded section by gripping jaws so that there is little danger of its becoming loose while a game is being played.

To Make the Music Lessons Easier; These Blocks Are Printed with Notes and Scales as Well as Animal Pictures

BLOCKS TEACH CHILDREN MUSIC AND NATURAL HISTORY

To familiarize young children with the rudiments of music, blocks have been prepared that have notes and parts of the scale printed on them. The spaces of different notes are designated not only by diagram but by a picture of an animal as "cat" for the note "c." The pieces thus teach a double lesson and afford all the amusement of an ordinary set of blocks.

BIG FLOATING ISLAND CAPTURED TO PREVENT INJURING DAM

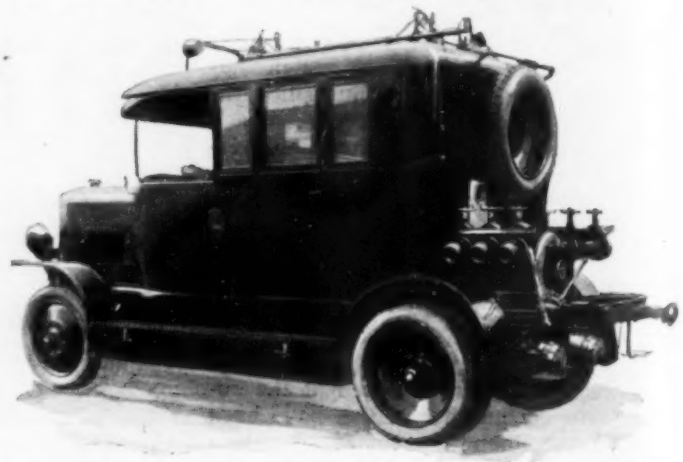
Floating islands have been discovered in various parts of the world but few of them caused any trouble. However, when a block of land, estimated to contain eight or ten acres, broke away from the banks and floated down the Racket river, in New York, toward a power-plant dam, men and trucks were hastily assembled to capture it. The island was stopped and lashed to the shore with cables, but broke away again. It was finally made fast by towing it into a bay and building cribs of logs filled with stone about it to prevent further journeying. The Racket river is a swift-flowing stream and carries a great volume of water.

ENGLISH CLIMATE SLOWS U. S.-MADE TIMEPIECES

American visitors to England have found that they must set their watches ahead three minutes or so to counteract the effect of the climate upon the works, and some travelers have had to adjust their timepieces at least twice a week. One manufacturer attributes the slowing to the damp climate. Many watchmakers declare that a change of altitude is more likely to affect the works than change of temperature.

FIRE ENGINE LIKE LIMOUSINE PROTECTS THE CREW

Firemen of a Paris company are shielded from unpleasant weather and water when answering calls or combating flames as their engine has an inclosed limousine-like body. The unit is provided with heavy tires, wire-glass doors, and several lines of hose can be attached to it at one time. A coupling hook at the rear permits using the outfit for towing.



Luxury for the Firemen; the Limousine Engine of a Paris Company Shields Occupants from Wind and Water

Racing Death in Icy Clouds

Pilot Wesley Smith, of the Air Mail, Dressed in Fur-Lined Clothes and Ready to Hop Off on a Night Flight across the Mountains, Where Storms Are a Constant Menace to Flyers

LABORING along in a sea of cloud and fog, a night air-mail plane not long ago fell victim to one of the last of the great unconquered enemies of flying —ice—and was brought down at an emergency field in the heart of the Alleghenies. You have seen pictures of great transatlantic liners staggering into port with bows loaded under tons of frozen seas, but few, outside aviation circles, know that the same danger faces the airman thousands of feet above the earth.

When the cold, wet clouds hang low over the mountain tops and the craft are forced to climb through them to gain sufficient altitude to clear the peaks, the trouble begins. The moisture collecting on wings and propeller turns to ice. Great balls of it accumulate along the front edge of the wings and break up the air streams so badly that, even though the added weight may not suffice to bring the ship down, the loss of lift through interrupted air streams does the trick. When that happens, there is nothing to do but hunt an emergency landing field, and trust to luck that it will be good enough to fly out of again without waiting for dawn.

With such fields located every seventeen miles, the danger of a forced landing does not appear great, but actually it is enormous. Many of the fields are bad, since they are only meadows leased from farmers; few of them are safe to fly into at night and still harder to fly out of. Added to a naturally difficult landing ground is the fact that the load of ice makes the landing speed of the ship from twenty to thirty miles an hour higher than normal—a condition that would be serious on even the best of fields.

"Bad weather," says Wesley L. Smith, one of the pilots who fly the night mail over the Alleghenies, "is our worst problem. And on this stretch we have more varieties of it than on any mail route in the country. I have flown over the Rockies, where altitudes are two and three times as great as they are here, but found them far easier to pass. In summer, the west seldom has thunderstorms, while we have them here almost daily. In the winter, in the Rockies it is either too bad to start out or else good enough to get through without difficulty. Here it is usually possible to start and often so bad at the finish that you wish you had stayed at home."

The summer rainstorms do not cause great trouble in themselves, for rain does not interfere seriously with visibility, but they usually are accompanied by low clouds and fogs, which come within 200 feet of the ground in flat country, and envelop all mountains, often rising to heights of 5,000 to 10,000 feet. At those

altitudes there are strong westerly winds, a decided help to the east-bound pilot, but ruinous for the west-bound plane, since gasoline is soon exhausted fighting them.

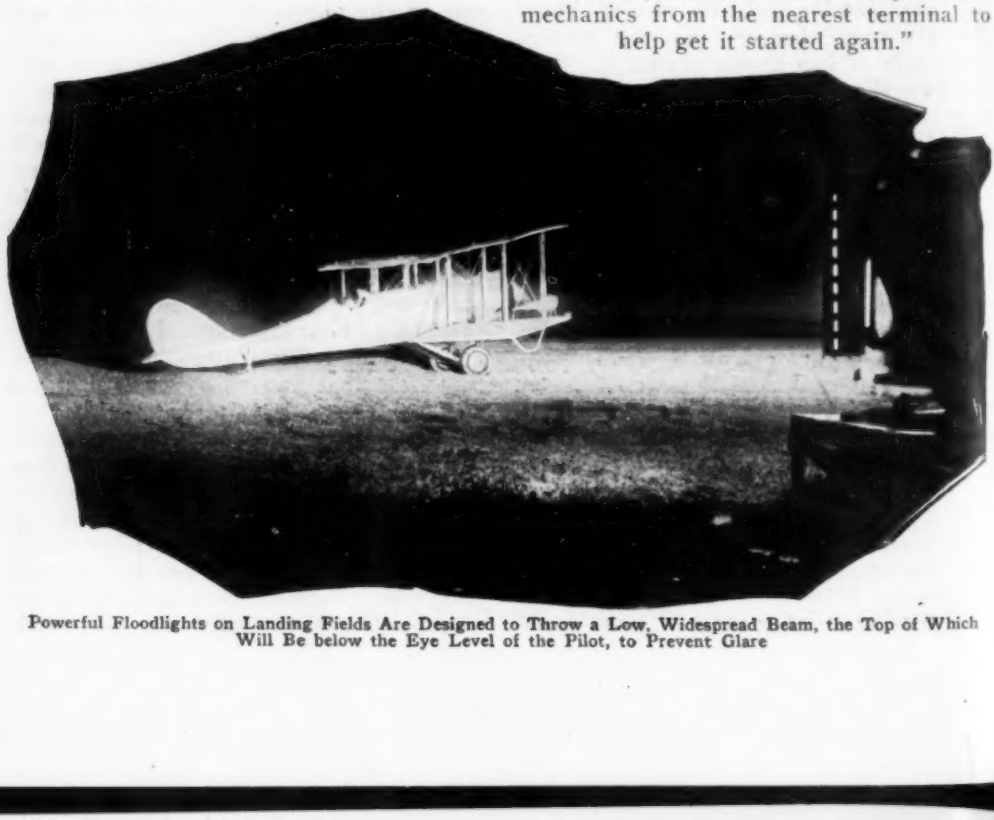
A St. Louis-Chicago plane last fall had an experience with fog on a bright moonlit night. When the pilot arrived over Chicago, he found 4,000 feet of fog and, because of the bright moon, could not see the powerful landing lights on the Maywood field. He circled around for two hours, hoping that a cloud might blot out the moon or the fog thin. Finally, with gasoline almost exhausted, he flew to the west for thirty miles to be clear of the city, shut off his engine to save the mail bags from possible fire, and stepped over the side with his parachute, thus making a safe landing.

"We can start," Smith says, "in any fog, and land through it if the landing lights are visible. I did this one night at Bellefonte. The mountain near the field rose above the fog and guided me until I could see the landing lights straight down through the mist. I circled off and came back for the landing, only to find I had lost the lights. I made three trials, and on the third got in safely, though the visibility was less than 500 feet.

"Winter brings its own problems, not only of ice, but of snow. The clouds usually are higher in snowstorms, touching only the mountain tops, but visibility is poor; usually straight down is the only direction in which you can see. I flew through such a storm for an hour east of Cleveland one night, seeing only the towns and beacons as I passed. I was not in the clouds, for my landing lights on the wing tips did not flare into huge balls of luminous vapor as they do when flying in clouds."

Snow is a great help in flying, for even on the darkest night it is possible to see the ground. But, on the other hand, deep snow on an emergency landing field prevents its use, for the unlucky man who lands there must await a thaw, or the arrival of skis to replace the wheels on the ship before he can take off. The main terminals are rolled to pack the snow and planes can land and start easily with the wheels.

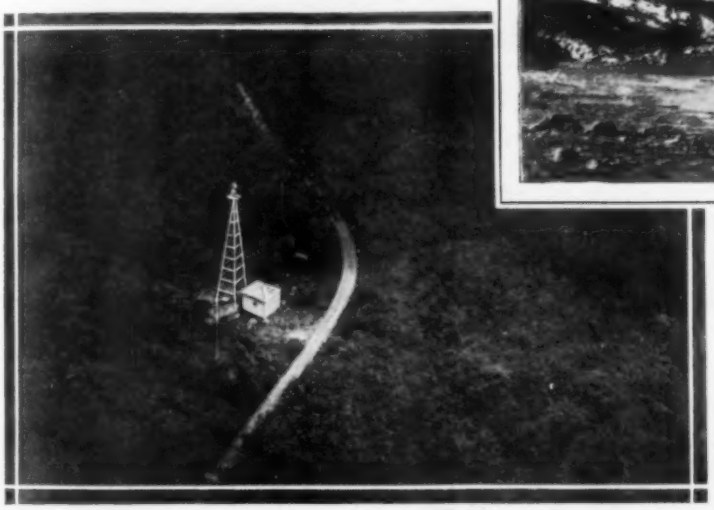
"When forced to land in winter on an emergency field," Smith said, "we always keep the engine running because it is too hard to turn over the propeller and start it again without assistance. An engine can be idled for several hours with very low gas and oil consumption, and the flight resumed when the weather clears. If the engine must be stopped, it usually is necessary to send out two experienced mechanics from the nearest terminal to help get it started again."



Powerful Floodlights on Landing Fields Are Designed to Throw a Low, Widespread Beam, the Top of Which Will Be below the Eye Level of the Pilot, to Prevent Glare

Flying isn't so bad, even in the coldest weather, in the new Douglas planes, which are replacing the old DeHavilands used for so many years. The cockpit is deep and the pilot is well protected, while a heater provides more hot air than really is needed. One of the exhaust stacks is surrounded by a jacket which delivers hot air in front of the flyer's feet. The outlet usually has to be turned away, however, because the air is so hot that it almost will burn the feet.

The pilot sits so low in the new craft that an arrangement had to be provided to hoist him up when he wanted to look over the side. The seat is equipped with powerful coil springs. Normally, his weight holds the seat down, but to get a look over the side he has only to ease his weight and it shoots up like a jack-in-the-box. To go down again, he presses a button and the seat sinks under him.



Beacon on a Wooded Mountain Top in the Alleghenies, Showing the Lack of Landing Fields; Above, a Beacon on a Wind-Swept Height

The new planes also have reduced the ice danger. Their wings are of the thick type, less inclined to pick up ice balls than the thin wings of the older type; the braided-cable stay wires have been replaced with streamlined steel braces, and the aileron controls are concealed inside the wings. The old craft had the aileron cables stretched along the front edge of the wing, exposed to ice and with unprotected pulleys. It was necessary to work the ailerons on the wing tips constantly in bad weather to keep the pulleys from freezing tight.

Flying instruments also are constantly improved. The main reliance for night work is the compass. Then there is a turn indicator to show whether the pilot is flying straight; a bank indicator to show whether the ship is going into a side slip; the fore-and-aft level, and the usual air-speed, engine-speed, gas, oil, water and electrical indicators. The bank indicator, built by one of the air-mail mechanics, is simply a slightly curved tube, filled with alcohol and containing a large steel ball, with very little clearance between the ball and the tube. If the ship banks, one wing dipping, the movement of the ball indicates the fact.

Besides watching all these instruments, the air-mail flyers have many other accessories to deal with. There are three navigating lights, red and green on the wing tips and white on the tail, and two landing lights, also on the wing tips. In addition

Hangars Are Covered with Lights to Warn the Pilots to Steer Clear in Making a Night Landing; the Dispatcher's Office Is in the Corner, and Back of It, the Pilots' Clubroom

to the latter, two big landing flares, attached to parachutes, are carried in a special compartment, from which either or both can be discharged by pulling a lever. Another lever pulls out pins which release the gasoline tanks, so that they may be dropped into space to remove any danger of fire in event of a crash. The tanks, which are built into the wings, are held in place by fabric strips passing beneath them, while connection to the gas pump line is made by a butt joint, kept tight by springs against the gaskets. All of the tapes are controlled by wedges, and when the release lever is pulled, the wedge slips out, freeing the tapes.

Despite the load of extra equipment for night flying—the lights and electrical system alone weigh 250 pounds—the new mail planes can carry 1,000 pounds of mail.

GLASS TRAPS FOR SUNBEAMS AID PLANT GROWTH

© The Fleet Agency

Little Glass Tents for Garden Plants to Aid Growth

As a substitute for permanent hothouse or garden frames, small tent-shaped glass units held in place by anchor wires have been used successfully in England. Set together along a row, they form a practically shadowless covering for the plants, retaining the sun's warmth, deflecting rains toward the roots and protecting the leaves from soot. The ease with which the "traps" can be moved is considered a desirable feature.

MONEY FROM CITY RUBBISH

Instead of paying to get rid of its rubbish, Los Angeles sells it to concerns which convert it into marketable materials. Garbage is sold for sixty cents a ton for hog food and a by-products company pays $500 a month for the city's junk. About eighty truckloads are received and sorted daily. Scrap metal is burned free of wood, paint and other foreign substances, pressed into bales and sold to a copper concern for about a cent a pound. Old automobile bodies are pounded into compact form for shipping by a huge pile-driver press. Tin cans, about 700 pounds to a load of rubbish, 100,000 unbroken bottles a month, paper and rags, radio batteries and electric appliances are among the things salvaged. Broken glass is shipped to China, where it is made into beads and lamp chimneys.

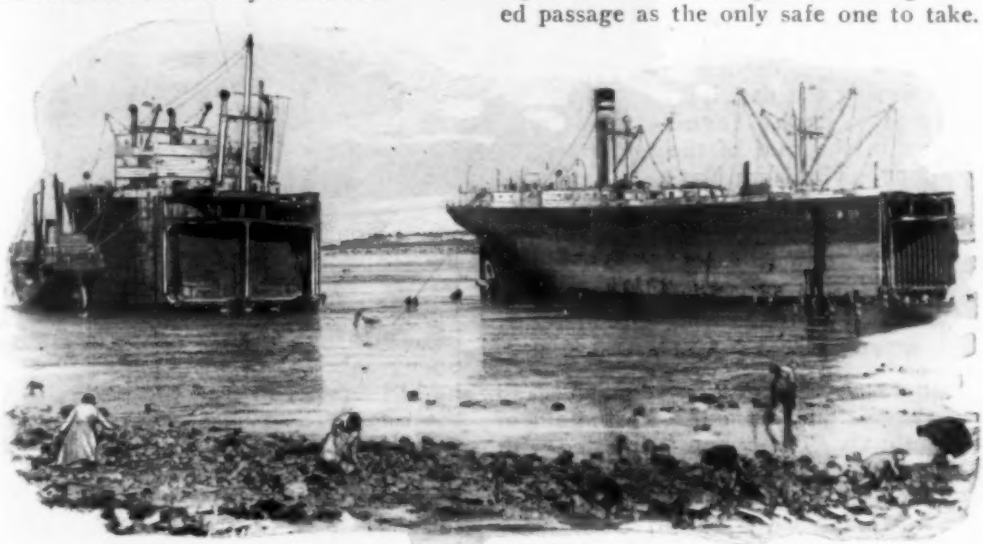
BIG STEAMER BROKEN IN TWO BY FORCE OF STORM

Waves pounding against the stranded steamer "Valsesia," off Bary island, near the English coast, finally broke it in two. Before further damage could be done, salvagers towed the wreck to safer waters. The boat was carrying a cargo of coal and, at low tide, persons living near took the opportunity to gather up pieces that had been scattered about by the waves.

Leading to the Safe Path across the Street; Stenciled Footprints to Guide Pedestrians

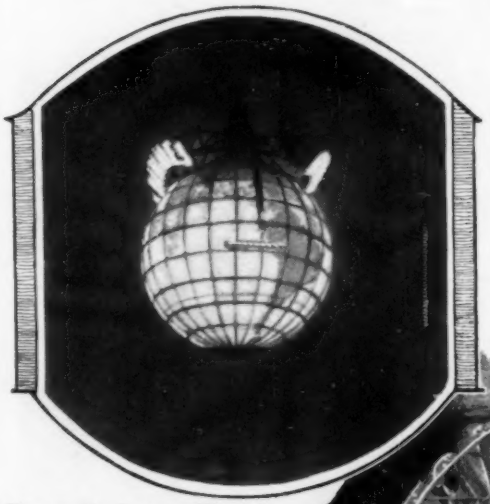
FOOTPRINTS SHOW PEDESTRIAN WHERE TO CROSS STREET

The trail of safety for pedestrians is plainly marked at intersections in Berkeley, Calif. In addition to the usual lines indicating the lane to follow, footprints, stenciled on the sidewalks and bearing the legend "Follow Me," point to the guarded passage as the only safe one to take.



Broken in Two after a Severe Storm, the Steamer "Valsesia" Stranded near the English Coast; in the Foreground Are Villagers, Picking Up Pieces of Coal from the Cargo

LIGHTED WORLD HOISTED AS SHIPPING SIGN



Sign as It Appears When in Position at Night with the Replica Ship Moving about the Globe, and Closer View in Daytime Quarters; It Is Lifted into Place with a Derrick

With the continents outlined in electric bulbs and a tiny ship moving across the "oceans," a miniature world is raised on top of a shipping office in Paris each night as an advertising display. The piece is hoisted with a large derrick and, during the day, is lowered to a sheltered alcove in the roof of the building. The large blazing letters around the top of the sphere spell the words "Messageries Maritimes"—the name of the concern.

CHANCE DISCOVERY OF MINES AIDED BY ANIMALS

Oil was recently discovered on an island off the coast of Honduras by the aid of a land crab. The region is infested with these creatures, which burrow into the soil like rabbits. One of them dug into a marsh under a cottage and the next day the occupant of the house detected the odor of petroleum. He had been seeking oil for years without success but the crab's burrow directed him to a high-grade flow. A western pioneer discovered a valuable quarry of sandstone in Idaho by a fragment in a badger's digging, and a crow aided indirectly in the discovery of the rich gold fields of Pilbarra in western Australia. A small boy picked up a rock to throw at the crow and, noticing glittering particles in the piece, took it to a farmer who recognized the flecks as gold. In his excitement, he telegraphed the governor of the colony, "Boy picked up stone to throw at a crow," and forgot to mention the gold. The governor wired back, "Yes; what happened to the crow?" The humorous incident marked the discovery of one of the world's richest gold regions. Camp fires have been instrumental in leading men to ore deposits. A Mexican Indian, upon awakening from sleep beside the fire he had lighted, found a piece of silver in the ashes. The chance discovery revealed that he had camped on ground worth thousands of dollars in rich ore. For a long time, settlers in Australia walked on soil that would have made them wealthy, without believing that the rock contained gold. In 1830, a convict was punished

after finding a piece of the precious metal. He was accused of melting a stolen watch, but the gold had come from a camp fire. A South African farmer, attracted by some bright stones in the clay on which his house was built, chipped them out and to his amazement found that they were diamonds. He traced the clay back to the pit from which it had been dug and so discovered one of the first South African mines that since have become world-famous. One of the diamond deposits in Kimberley was discovered by a child who found a "pretty stone" while she was playing on the banks of the river. She took it to her mother, who showed it to a merchant. Everyone laughed when he pronounced it a diamond. He wrote his name on glass with the stone, but the others were still unconvinced. He purchased the diamond for a trifle and sold it for $2,500.

RACK OF TOYS FOR BABY'S CRIB SAVES NURSE'S TIME

Six or more toys are suspended from a bow-shaped support which is clamped to the baby's crib, preventing loss of the articles and saving the nurse the trouble of hunting for the things or picking them up. The toys are always within the infant's reach and their variety is intended to afford the baby added amusement.

Toy Rack Attached to Crib; Pieces Are within Reach of the Baby and Cannot Get Lost

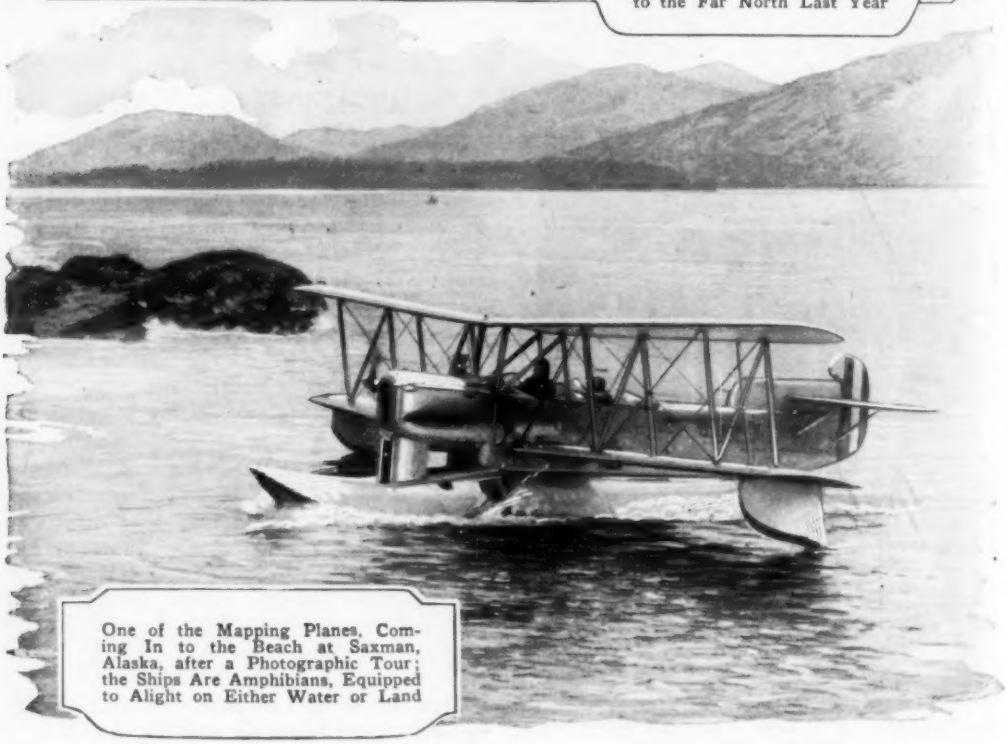
"Double" Camera for Action Views; Top Part Is a Finder without Curtain to Interrupt the Operator

CAMERA FOR ACTION PHOTOS HAS CONSTANT FINDER

One of the difficulties in taking pictures of animals or other moving objects is that there often is a considerable change in the subject's position between the last look at the finder and the instant the exposure is made. To overcome this difficulty, a photographer, who has made a specialty of animal pictures, has devised what appears to be a large double camera. In reality, it is a single instrument, but the upper part is essentially a duplicate of the lower except that it contains no film or plates and projects a constant image of the subject upon a finder at the top up to the very instant the picture is taken. This eliminates the interruption of a "curtain" and makes certain that what the operator last saw in the finder before opening the shutter will appear on the negative properly focused.

¶In winter, the snowshoe rabbit changes its coat from brown to white.

Turner Lake, Hidden among the Snow-Clad Peaks, near Juneau, Alaska, Is Typical of the Myriad Mountain Gems Revealed by the Aerial Survey of the Navy Department, Which Sent a Photographic Mapping Expedition to the Far North Last Year



One of the Mapping Planes, Coming In to the Beach at Saxman, Alaska, after a Photographic Tour; the Ships Are Amphibians, Equipped to Alight on Either Water or Land

Flying over Burrough's Bay, Alaska, One of the Amphibian Planes Used in Mapping the Mountain Fastness Is Photographed by the Flyers in Its Companion Ship

Flyers Map Alaskan Mountain Ranges

Navy Planes Cover Fifteen Thousand Square Miles and Bring Back Pictorial Record of Impassable Snow-Clad Heights

SUCCESSFULLY mapping some 15,000 square miles of largely unexplored territory on Admiralty and Douglas islands, two of the long chain of American-owned Aleutian islands, navy flyers last summer set a new record for surveying in the Far North. Much of the country covered was so wild that it is questionable whether it could have been surveyed on foot. Over it the planes swept at ninety miles an hour, with cameras clicking automatically every few seconds, and covered in a single hour a greater area than an ordinary surveying party could have traversed in weeks.

In addition to the mapping, in which pictures were taken with camera pointed straight down, hundreds of "obliques" were shot of snow-clad mountain tops, hidden lakes, deeply shadowed coves and canyons and other natural features which will be invaluable in the work of the forestry, agriculture and fish commissions. The camera disclosed immense forests, hitherto unknown, containing millions of feet of lumber. Mountain lakes, well stocked with fish, were revealed for the sportsman, and aerial views of great mountain heights, snapped at close hand, will prove of interest to climbers who wish to explore them.

The surveying party was equipped with amphibian planes capable of alighting on either land or water. Because of the isolated region in which they operated most of the time the surveying party had to transport complete equipment and supplies from the States. A mine sweeper furnished quarters for the officers and crew, while a large sea-going barge, fitted with a big deck house, provided a machine shop, photographic laboratory and rooms for the equipment and other supplies.

At some places the facilities of the salmon canneries were utilized, and, at the main base, huts were erected on shore.

Pulling the Tower across the Prairie; after a 600-Foot Journey, It Was Only One Inch Out of Plumb

STEEL WATER TOWER AND TANK MOVED SIX HUNDRED FEET

Moving a steel water tower, 150 feet high and surmounted by a large bowl, with a combined weight of more than 150 tons, seems a difficult engineering task, but the problem was solved by a Texas firm. So evenly balanced was the weight, on steel rails laid across the prairie, that one man was able to pull the tank with the aid of the tackle outfit. The first step was to build a framework of heavy timbers about the base of the tower, then tie the four corner posts together so that they could not spread. Rails were then laid and the tower was moved along them by means of steel rollers.

CAN AIRPLANES BE SILENCED?

Is it possible to silence the airplane? Recent tests in England proved that the noise consists of two parts, a musical hum caused by the exhaust of the engine and a roar from the propeller. The stays of the aircraft have an æolian song of their own, which occasionally is heard at a greater distance than any other sound. It may be that vibration of the engine contributes to the noise of the airplane, but this is uncertain. It is possible that means might be found to silence the hum, but little would be gained if the roar could not be stifled also.

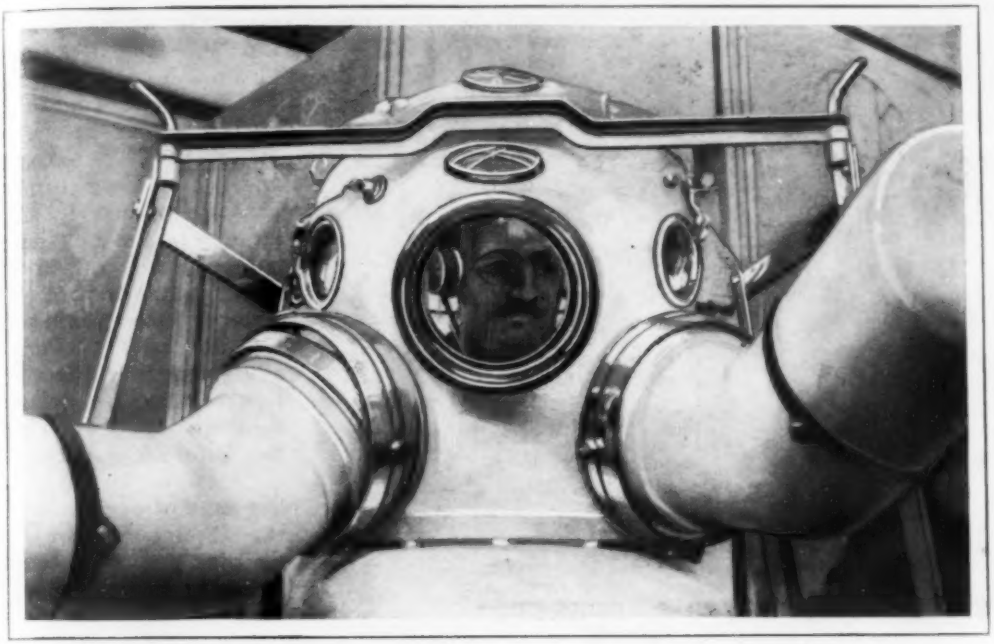
ONLY FEW OCCUPATIONS LEFT TO MEN EXCLUSIVELY

Women have established themselves in all but thirty-seven of the occupations followed by man, it was shown at a recent exposition in Cleveland, Ohio. Mining, electrical engineering and driving locomotives are among the fields that have not yet been entered by women, but they have patented a number of electrical appliances and several are engaged in the merchandising and managing phases of engineering as well as in many other branches of this field of endeavor.

FULL-SIZE COMB THAT FOLDS FITS IN SMALL CASE

One of the common objections to pocket combs is that they are too small to be fully effective. This limitation is overcome in a full-size article that folds into a tiny case for the pocket or traveling bag. It has three sections which lock together, making the comb rigid when opened.

Folding Comb and Its Small Case; the Hinges Lock When the Comb Is Extended



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Radio Now Serves the Diver; Headphones on Occupant of Cage, through Which He Can Listen to Signals and Speech Broadcast from Tender Crew at Surface

WIRELESS SET IN DIVER'S CAGE REDUCES WORKER'S DANGER

One of the latest types of diving apparatus, exhibited in Berlin, contained radio headphones and connections to a small broadcasting set carried by the tenders at the surface, so that the worker within the cage could keep in touch with the men above. In this way, he could make certain that his signals were received and correctly interpreted.

BREAKAGE OF LINER'S GLASS INCREASED BY SALT AIR

Ten thousand dollars a year may seem a large amount to set off against the mysterious breakage of table glass on an ocean liner, but an English expert explains it partly on the ground that the action of the salt air causes a "disease" in the glass which results in extreme brittleness and consequent early breakage. Glass, he declares, is highly variable in strength and its resistance cannot be determined as easily as that of some other materials. The strongest glass, as a rule, breaks into the greatest number of pieces. On ocean liners, glass decay, due to atmospheric influences, is manifested by minute holes appearing in the substance and these deepen so rapidly that breakage is sometimes occasioned by merely touching the glass with the fingers.

ROLLING AUTO ACCELERATOR MAKES DRIVING SMOOTHER

Safer and smoother driving is said to be realized from a roll type of accelerator pedal for small cars. It is installed at the right of the other pedals and is easily distinguished from them by its shape and color, so that accidents are not likely to happen through use of the wrong pedal. When pressed, it swings and rolls forward smoothly and without jerks so that a perfectly even, and immediate, response is noticed.

Forcing Rabbit from Its Burrow with the Steel-Wire Ferret

STEEL WIRE SERVES AS FERRET IN HUNTING RABBITS

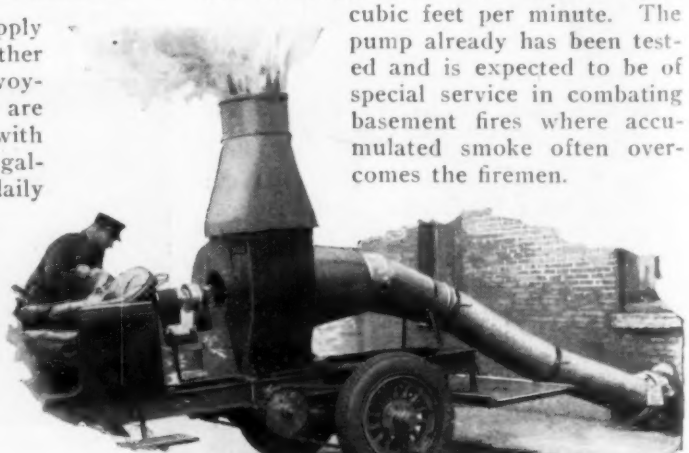
To drive rabbits from their holes, a western inventor has devised a wire arrangement that takes the place of a ferret. It is twenty-seven feet long when extended, weighs less than two pounds and is easily carried. Made of special steel, it does not break when thrust and prodded in a hole.

LINERS CARRY FORTY GALLONS OF WATER PER PASSENGER

To insure a plentiful supply of water for drinking and other purposes during ocean voyages, the large steamers are equipped with huge tanks with a capacity of thousands of gallons. Estimates fix the daily consumption of fresh water by a first-class passenger on the "Majestic" at forty gallons. The average for the entire ship is approximately twenty-five gallons. The steamer takes on 1,424,000 gallons of fresh water at New York for every voyage. Of this, 804,000 gallons are for the boilers. On a round trip, the "Majestic" uses more than 3,000,000 gallons. The "Olympic" consumes 680,000 gallons, the "Homeric" 860,000 gallons and the "Belgenland," 537,600. Almost all the large steamers are equipped with filtering plants and, although the water is pure when taken into the tanks, it is usually given three filterings before it is piped to the drinking supplies and two before it goes to the bathrooms. In the earlier days of ocean travel, the amount of fresh water each passenger could have was limited. Third-class passengers received only three pints a day against about fifteen gallons now.

"SMOKE EATER" IS LATEST AID IN FIGHTING FIRES

Operating on the same principle as a vacuum cleaner, a smoke pump is intended to withdraw fumes and polluted air from building interiors, during a fire, for the protection of the men. A huge hose, about fifteen inches in diameter, is passed into the room to be pumped out and air can be withdrawn at the rate of 10,000 cubic feet per minute. The pump already has been tested and is expected to be of special service in combating basement fires where accumulated smoke often overcomes the firemen.



Drawing Smoke from Basement with the Suction Pump

"Above the Scenes" in the U. S. Senate Chamber; View of the "Garden" of Lights Placed Back of the Ceiling Glass to Illuminate the Room's Interior

HUNDREDS OF HIDDEN LAMPS LIGHT SENATE CHAMBER

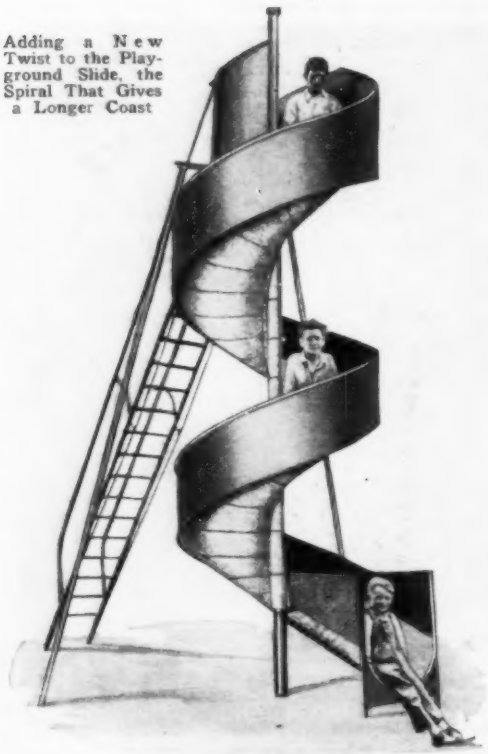
To provide sufficient illumination for the United States senate chamber, more than 1,100 electric lights have been installed back of the glass in the ceiling. There are 550 fifty-watt lamps, 460 of 100 watts and 178 seventy-five-watt globes. All are arranged in such a way as to produce an even and effective glow.

FLY WINGS MEASURE HEAT IN DISTANT STARS

Parts of an instrument being constructed at the Smithsonian Institution for measuring the heat in the fainter stars are made of fly wings, so delicate are the units for the apparatus. It is the work of Andrew Kramer, "wizard craftsman," who has astonished his fellows by similar contrivances of almost unbelievable accuracy. For instance, he has shaved down a brass tube to such thinness that it crumpled under its own weight like paper. One of the parts in a device for standardizing measurements of the sun's heat received on the face of the earth is a screw thread cut in a piece of ivory so thin as to be almost transparent.

GOLF SCORER ON WATCH STRAP AIDS ACCURATE GAME

Attached to the same strap that holds the wrist watch, a dial recorder for keeping track of the number of golf strokes, eliminates the use of a pencil and pad. It may be removed from the strap when the game is finished so that the timepiece can be worn alone.



Adding a New Twist to the Playground Slide, the Spiral That Gives a Longer Coast

SPIRAL SLIDE FOR PLAYGROUND INSURES CHILD'S SAFETY

The principle of the winding slide fire escape has been adapted to a playground unit in a chute with high sides to prevent the child from falling, and a safe ladder for reaching the top. An additional feature of the equipment is that it provides a longer slide than the straight type and does not take up so much room.

HAIR WAVER HEATED BY WATER PREVENTS BURNING

Heated by water instead of by flame or electricity, a hair waver introduced in England eliminates the danger of burning. Boiling water is poured into a plated container which forms the upper part of the waver. It cannot spill although the steam is allowed to escape. The temperature of the heating element is kept below the boiling point, and since there is little risk of damaging the hair, the waver may be kept in one position for a longer time, producing more permanent results.

© C. A. Oldroyd

Hair Waver, Showing the Chamber for Hot Water at the Top; Long Applications Are Possible

VIOLET RAYS BRING HAPPINESS TO ANIMALS IN ZOO

To improve the health and disposition of animals in the London zoo, authorities have decided to adopt a kind of glass that admits the ultraviolet rays from the sun instead of the ordinary material which excludes the beneficial beams. The effect of the new glass, as compared with the old, was illustrated in the case of "Murphy," a young orang-utan. The animal had been cross and finicky about its feed and was bald in spots, but since the installation of the special glass, "Murphy" has been cheerful, willing to eat almost anything and has a new coat of hair. Like results were observed upon a family of small monkeys, and lizards, which moped and died during the winter months, are being kept in good health with the aid of ultraviolet rays. Zoo keepers in other parts of the world are studying the new glass with a view to using it in animal houses.

ONE TON OF SOFT COAL YIELDS MANY GALLONS OF OIL

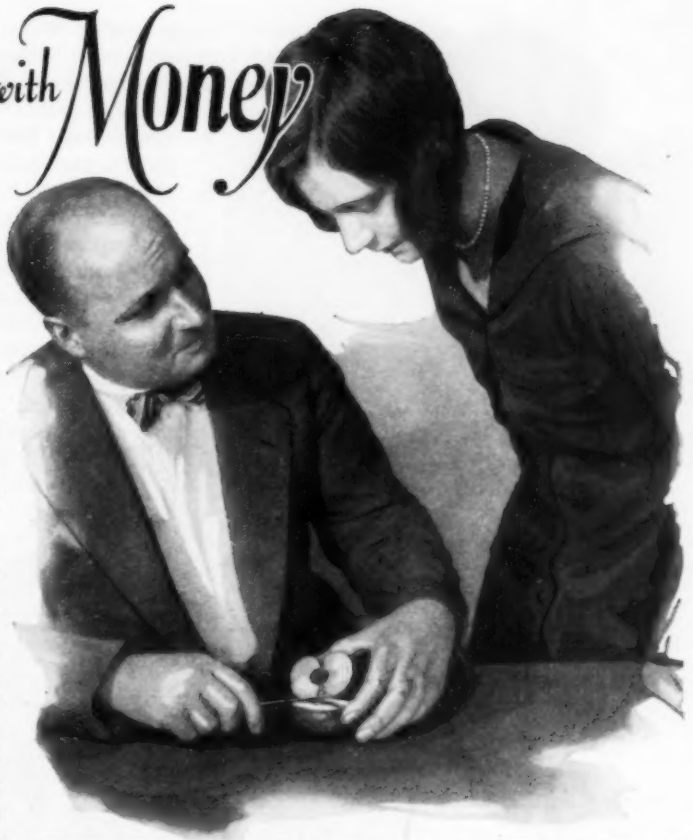
Lubricating and fuel oils, and aromatic compounds suitable for "no-knock" motor fuels, to a total amount of 140 gallons can be derived from a single ton of soft coal, according to Dr. Friedrich Bergius of Heidelberg, Germany. He is credited with the invention of a process for liquefying coal into oils by treatment with hydrogen under great pressures. The net yield, after deducting the coal consumed in the operation, is 104 gallons to the ton. Dr. Bergius says that all problems touching the practical and economical application of the process have been solved.

Magic with Money

By W. B. GIBSON

MANY of the best and cleverest tricks are performed with coins. Those explained in this article are intended for the reader who is not skilled at sleight-of-hand; and they can be learned by anyone with very little practice.

The "Coin from the Elbow" is an interesting trick. You show both hands empty, and deliberately drop a penny down your left sleeve. Then you place the fingers of your right hand against the left elbow, and mysteriously draw the coin through the cloth of the sleeve. Two coins are used. One is set between the buttons of the left sleeve, near the wrist. The front of the left hand is kept toward the people watching the trick, so they do not see the hidden coin. The first is dropped in the left sleeve. Then you place the tips of your right fingers behind the left sleeve, and slide the right hand down to the left elbow. Your fingers pick up the hidden coin on the way, and carry it down to the left elbow, where it is drawn into view, apparently through the sleeve.



Discovery of the Missing Coin in an Apple or Orange Is a Simple Trick That Always Mystifies the Onlooker

Here Is How It Is Done, with a Bit of Wax Holding the Coin; in Actual Performance the Finger Hides the Penny

Here is a quick and surprising method of making a coin disappear. Hold the coin in your right hand and slap it into the left palm, two or three times, making a downward sweep with the right hand. As you finish the last sweep, you can show both hands empty. This is accomplished by keeping your eyes on the left hand, so that everyone watches that spot. The right hand, in its last upward sweep,

Top Row, Start of Eight-Coin Puzzle, Second Row, the Finish, and the Others, the Four Successive Moves of Two Coins Each

it, tear the box to pieces, to show that the coin is not there. This will prevent discovery of the opening in the end.

A coin may also be made to vanish with the aid of a small piece of paper, about the size of a playing card. Lay the coin in the center of the paper, and fold in the sides, then fold in the outer end of the paper, holding this in your left hand. As you tilt the outer end upward, the coin will slide into your left hand. Then you must fold up the inner end of the paper with your right hand, and lay the paper on the table with the right hand. When the paper is later unfolded, or torn to pieces, the coin will be gone. Either of the preceding tricks may be performed with a borrowed coin, which has been marked. As the coin is in your possession, while the observers think it is in the box or the paper, you can cause it to reappear in simply drops the coin on the brim of your hat, in front. The coin remains there, while the hands are shown empty. If you are not wearing a hat, you can drop the coin in your hair, but, in this case, a small coin must be used for the trick.

The Coin Is Dropped Up the Sleeve, While a Duplicate Is Concealed between the Coat Buttons for Later Production; at Right Is an Easy Way to Make a Coin Disappear

Any coin may be made to disappear with the aid of a match box. First, prepare the box by cutting a slit in one end of the drawer, at the bottom. Place the coin in the box, close the drawer, and shake the box sideways, so that the coin rattles. Then tilt the box and the coin will slide through the slit into your hand. The box is then laid aside, and when it is opened later on, it is empty. If anyone still thinks that the coin is in the box, and wants to examine

a most mysterious fashion. You need a table knife, with a broad blade and an apple or an orange. They are lying near by. You bring the fruit forward, showing that it is entirely unprepared. Then you cut it in half, and the coin is found in the core.

On the side of the knife blade, rather close to the handle, you must previously affix a dab of soft wax. In getting the knife, press the coin against the wax, bring on the knife with the orange, but hold the knife so that the coin is out of sight.

Cut the examined fruit with the blade, and push the knife forward so that the coin goes into the orange. Press the latter firmly and withdraw the knife. The coin will remain in the orange, and you may let anyone separate the two hemispheres and find the coin between them.

How Many Pennies Piled Up Equal One on Edge? Try It and See; at Left Is a Simple Method by Which an Extra Coin Can Be Added to Those Placed on the Cardboard

Another method of recovering the missing coin requires nothing more than a piece of cardboard, a little larger than a playing card, or a small pin tray, if one is available. You place the cardboard on your left hand, so that it hides the coin that is resting there. Then you ask different people to lay coins on the cardboard. When you have collected several coins, let them slide into the hands of the person who lent you the missing coin. At the same time release the coin from beneath the tray, and when he counts the coins that have been deposited in his hands, he will be surprised to find his coin among them.

A Slit in the End of a Pocket Match Box Provides an Opportunity to Make a Coin Disappear from the Box at Will or to Reappear

There are two very interesting "stunts" with coins that are not really tricks; but they are worthy of mention, because they never fail to create surprise. Suppose a one-cent piece is stood on edge. How many pennies, stacked in a pile, would be required to reach the same height? Most persons will say that five, six, or seven are sufficient. But the correct answer is thirteen. When you state that fact, nine out of ten people will not believe you until

Another Easy Method of Making a Coin Disappear from a Folded Paper, Which Can Then Be Torn in Bits

you have actually demonstrated it with the coins themselves.

The other perplexity is this: "How many pennies can you lay on a silver dollar without allowing any of them to extend over the edge?" The pennies, of course, cannot be stacked, but must be laid side by side on the larger coin. Nearly everyone will say that three, four, or more pennies can be thus placed; but as a matter of fact, one is the correct answer. The second penny will go over the edge of the silver dollar. This is another fact that people won't believe until they see it.

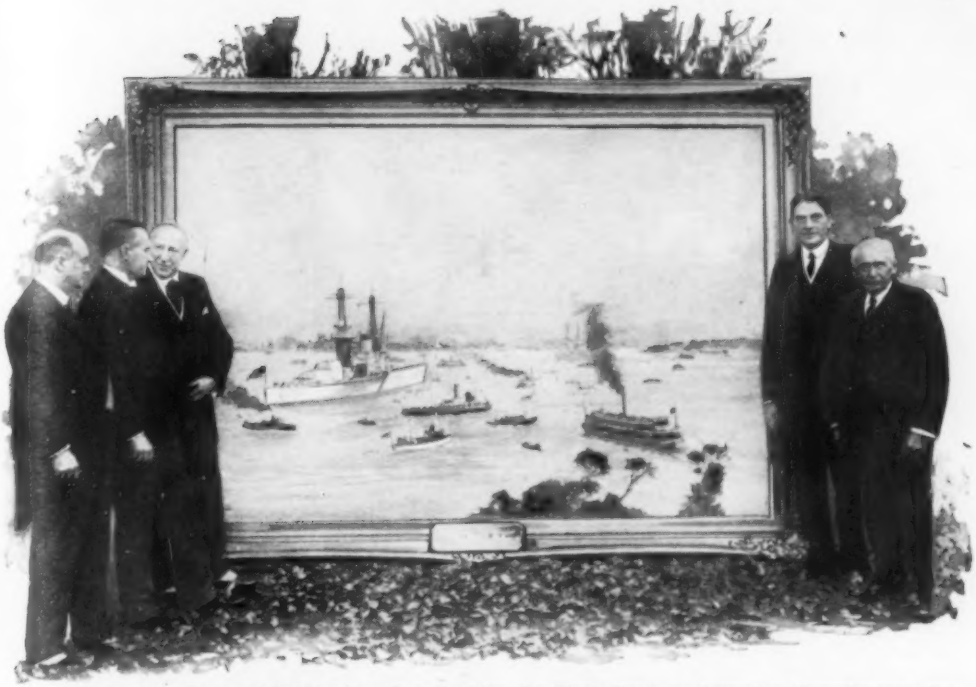
A good little trick may be performed with a nickel and a small cylindrical box, of the type which contains a roll of half-inch adhesive tape. First you drop the coin in the box, put on the cover, and give the box a shake to show how easily the coin turns over inside. The coin is put in head up; after the shake the tail side is up. Then you drop the coin in again, clamp on the lid, and shake the box vigorously for ten or fifteen seconds. Looking at the top of the box, you say: "The coin is now lying head up." When the cover is removed, there is the coin, head up! This trick may be repeated several times; but you will be right every time.

The secret lies in the fact that the box is not quite as high as the diameter of the coin. As previously mentioned, people invariably underestimate the diameter of a coin; and the coin looks very small and insignificant, when dropped in the box.

So when you place the coin in the box, simply note which side of the coin is up. Then you may put the cover on, and shake the box a great many times; but the coin will not turn over.

But before you began the trick, you showed that the coin did turn in the box. This was accomplished by putting the cover on very lightly. The thumb and forefinger hold the cover in place, while you give the box a few revolving shakes, to make the coin turn over. The slight gain in the height of the box thus obtained allowed the coin to turn. Some of these boxes are not quite so deep as others. If you happen to have a shallower box, use a penny instead of a nickel. You can easily discover what kind of a coin to use by standing the different coins on edge in the box. The coin that just barely projects above the rim is the one to use.

There is a very puzzling trick with eight pennies. Lay the coins in a row so that



Left to Right, J. J. Rouse of Sydney, President Coolidge, Sir Hugh Denison, Australian Commissioner, Secretary of Navy Wilbur and Secretary of State Kellogg beside Painting of Fleet

they alternate heads and tails. You must then move the coins two at a time to other positions, so that in four moves all the heads and tails will be together, observing the rule that the two coins moved each time must be side by side.

The diagram explains how the four moves are made, and you should practice them until you can perform them quite rapidly. You can then make the moves yourself, and the average person will be unable to follow them.

A juggling trick, which requires a little practice but is a very entertaining feat once the knack has been acquired, consists in laying a dime or a penny on your wrist, the palm of the hand being held upward, and making the coin turn over without touching it.

Simply snap your thumb and second finger. The wrist action of the muscles will make the coin turn a neat somersault. Find the right spot on the wrist, and it will work very easily.

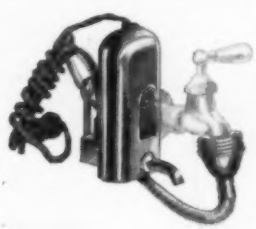
¶Lighthouses on the Atlantic coast have been painted with large arrows pointing north to help guide aviators.

GIANT PICTURE OF FLEET GIVEN TO PRESIDENT COOLIDGE

In commemoration of the visit of the United States fleet to Australia, Charles Bryant, of New South Wales, painted a picture showing some of the battleships at anchor in the harbor at Sydney. The painting was presented to President Coolidge and is to hang in the national art gallery at Washington.

FAUCET WATER HEATER RUNS FROM LIGHTING SOCKET

Running hot water is quickly available from a portable electric heater that is attached to the faucet and supplied with current from a light socket. A flexible nozzle leads the stream through a jacket in which is a special heating coil. The hot water comes out of a spout on this housing.



BLOCKS IN CATHEDRAL COLUMN EACH WEIGH EIGHT TONS

Pillar of the Nave for the Cathedral of St. John the Divine under Construction

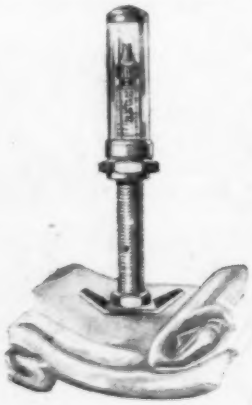
Under the expert hands of master craftsmen, the Cathedral of St. John the Divine, in New York city, is slowly taking form. The enormity of the task is emphasized in such details as erecting the huge supporting columns for the nave. The pillars are composed of layers of four great blocks of limestone, each weighing eight tons. The column illustrated here, not yet finished, weighs more than 1,200 tons. Accurate fitting and careful joining are necessary to give the unit its strength and evenness.

TEMPERATURE EIGHT MILES UP NINETY-SIX BELOW ZERO

A United States weather balloon encountered a temperature of ninety-six degrees below zero Fahrenheit at an altitude of a little more than eight miles during a recent "sounding" of the upper air. This represented a drop of more than 166 degrees from that prevailing at the surface near Royal Center, Ind., where the balloons were started. In all, forty-four flights were made, either singly or in groups. Recording instruments and a self-opening parachute were attached to each. Thirty-seven of the cases were found and returned to the weather bureau after flights that, in some cases, extended over 200 miles. Some of the balloons reached altitudes never attained by any human being. The highest went about ten and one-third miles. At this point, a slightly higher temperature was found than at the eight-mile level. This relatively warmer area is known as the stratosphere. It has several peculiarities, being warmer than the air below, free from clouds, and the winds are less severe than in the layers just beneath it. The bottom of the stratosphere varies in altitude, the instruments showed. Its height is not known. Balloons have ascended nineteen miles without going past it. The balloons used for this service are about forty inches across when inflated and they expand to a bursting point in the rarefied air. The instruments with their parachute and wicker case, which serves to take up the shock when the outfit reaches the earth, weigh less than a pound.

TIRE VALVE HAS BUILT-IN PRESSURE GAUGE

An automobile tube now on the market is equipped with a valve which has a built-in air-pressure gauge, visible under a transparent cap, so that each tire shows its condition at a glance. The main valve stem has a piston, held down by a spring, and the piston wall is engraved and marked for various pressures. The piston is hollow and the usual filler cap screws in the top of it, the valve parts being inside the piston. The dust cap is replaced by one with non-breakable transparent sides, so that the reading can be made readily.



HOW SKYSCRAPER GOT ITS START

The constantly increasing height of modern buildings is made possible by two inventions—the passenger elevator and the steel frame, which not only supports itself but carries the weight of the confining walls. When the first Equitable building was built in New York, in 1869, rising to seven stories, with a passenger elevator with a speed of 100 feet a minute, it was considered a daring departure, but quickly justified itself. It took eighteen years, however, from that date before the first steel skyscraper, twelve stories high, was built in Chicago. That was the Tacoma building. Others followed quickly.

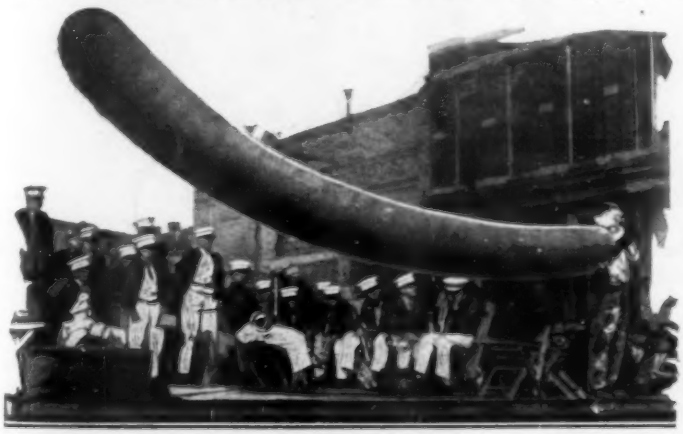
ARTISTS TURN TO IRONWORK TO EXPRESS IDEAS

Chimney Pot with Wolfhound Vane Done by American Artist in Wrought Iron

Handwrought ironwork, including chimney pots, weather vanes, fire screens and lanterns are being produced by members of the American art colony in Paris who have given up paints and the sculptor's chisel for forge and anvil. Their work has attracted so much attention that recently a number of American artists deserted the annual salon and organized a purely American exhibition. Some of the work, such as the combination of wolfhound weather vane with a revolving chimney pot, showed unusual originality.

STRENGTH OF LUNGS TESTED BLOWING UP TUBE

The blowing championship of Nebraska was awarded to a young farmer of that state after he had inflated an inner tube to a length of twenty feet and a circumference of fifty-six inches wholly by his lungs. Shortly after, the tube burst. It took eighty minutes of puffing to fill the tube.

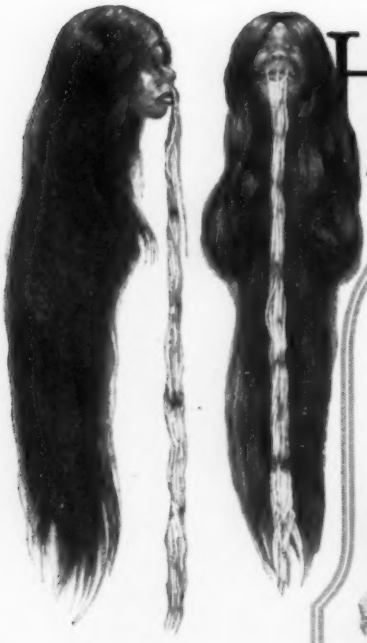


Just Before It Burst; the Inflated Inner Tube After the Champion Had Puffed at It for Eighty Minutes

USES OF SHELLAC

Used in hundreds of industries, shellac is an important commodity in scores of articles where it is not commonly known to play a part. For instance, shellac and not wax is the basis of sealing wax; it is used by the ton in making varnish. Hatmakers employ it to stiffen brims and it is utilized in large quantities in the motion-picture film industry.

Head Hunters



Pair of Shrunken Head Fetishes of the Jivaro Indians in the Field Museum, and an Indian Warrior's Gala Dress

BELIEVING that possession of an enemy's head makes the spirit of the dead warrior a slave to his vanquisher, the Jivaros of South America are the possessors of a sacrificial rite that is unique among savage tribes. Although standing very low in the scale of intelligence, they long ago evolved a process of shrinking the captured head to the size of a baseball bat, without destroying the features or their natural proportions.

How it was done remained a mystery long after the first of the peculiar trophies had been brought out of the interior around the headwaters of the Amazon tributaries. At first the heads were passed on from tribe to tribe until they reached the outposts of civilization, far up the Amazon, and fell into the hands of white traders and explorers from museums. Not until recent years have white men succeeded in penetrating the upper reaches of the Pastaza and Morona, the two principal rivers along which the Jivaros dwell, to learn first-hand the methods used in the process.

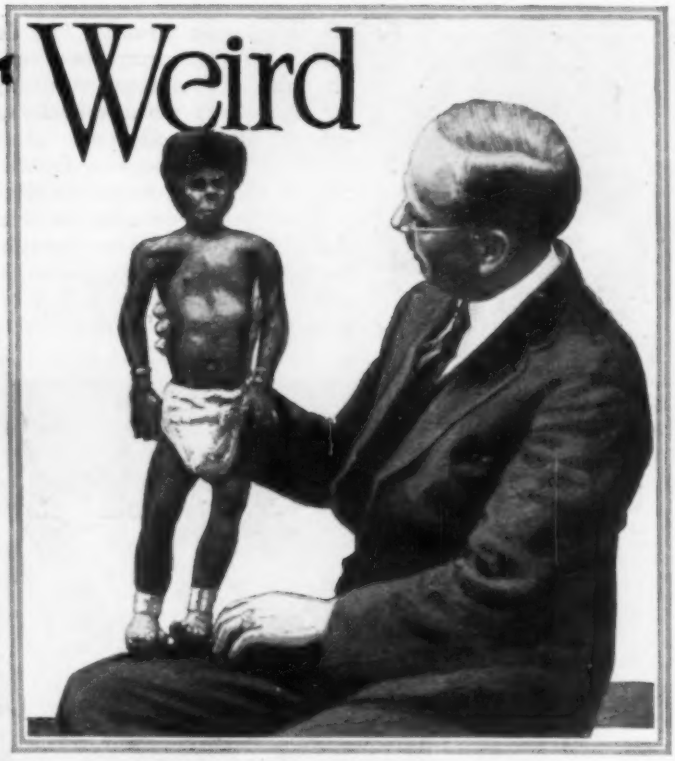
Head hunters were known before—there are still some left in the South Sea islands—but the ability to not only cure the skin but actually shrink it to a fraction of its former size without destroying its lifelike qualities was as amazing to the museum explorers as the discovery of the first embalmed body of a long dead Pharaoh.

The Jivaros, though only 25,000 strong, are also unique in that they remain as independent today as when the first Spaniard set foot in America, having always succeeded in resisting conquest. Until quite recently their only weapon in battle was the spear and shield, though now they have begun to acquire firearms. They used the blowpipe, too, with poisoned arrows, but only for killing game.

Practically all of the head-hunting expeditions are the result of one or more members of a tribe having died from natural causes, which the friends of the dead ascribe to sorcery from another tribe, whereupon they take the war path, armed and with several smooth round rocks for each warrior.

The rocks are the chief requirement for curing the heads they hope to take. After

and their Weird Rites



Entire Body Shrunk by the Jivaro Process; Two Such Are in the Hayes Foundation Collection, but Their Genuineness Is Doubtful; Below, Jivaro Warrior in Costume Worn When Listening for Spirit Voices in the Forest

the enemy is slain and the head severed, a slit is made up the back of the neck and the skull and flesh removed. The slit is then sewed up, and the head boiled in water with some antiseptic herbs. Next a fairly large round stone, warmed in the fire, is inserted through the neck opening, and with another warm round stone the warrior proceeds to "iron" the skin until it gradually shrinks to nearly the size of the interior rock. This is then removed and a smaller stone substituted, the process being repeated until the head is reduced to the desired size. The whole preparation is completed in a day.

Following the shrinking, a slit is made in the crown and a long cord inserted to suspend the trophy, while streamers of colored cotton yarn are attached to perforations made in the lips.

When the war party returns, a tribal celebration is held, in which the trophy, suspended from a pole, is the principal feature. The victor for several days has to observe rigid regulations and taboos, without which it is believed great harm would befall him. Eventually, after he is deemed to have mastered the slain man's spirit and made it his slave, the head is removed to his hut as an individual trophy.

The Jivaros are not afraid of open fighting, but usually prefer to attack at night, timing the assault to come just before dawn. Their huts, in which several related families live, stand singly and alone in a clearing of the jungle. The house is

Jivaro Woman; a Fetish Head from the Milwaukee Museum, and a Jivaro Wearing Part of His Ceremonial Ornaments for the Curious Rites That Attend the Enslaving of a New Spirit

to be without power. The demand for trophies for museums and collectors became so great recently, however, that the natives took to killing people of their own tribe, or even stray white travelers, in order to earn the price offered by the collectors. As a result, the governments of Peru and Ecuador now forbid exportation of the trophies, as one means of keeping the rite confined to tribal battles.

The Jivaro country is similar in many ways to the South Sea islands, even though it lies more than a thousand miles from salt water. Like the islanders, the Jivaros have developed as a water-going race, since the only means of communication through the tropical jungle is the myriad creeks. The district, in the main, is quite flat and swampy, all the streams that pour into the Amazon being unable to carry off promptly the tremendous rainfall of the tropics. The nearest approach in North America to the swampy jungle was the interior of the Everglades. The main difference is that the tropical vegetation is even thicker in the Jivaros' land, spanning the streams so thickly that often only tiny tunnels are open

built of poles, with a thatched roof, and sometimes is surrounded by an outer stockade. Each man able to carry arms has a separate berth, arranged around the outer wall, with slits through which he can ward off attack. In the narrow jungle paths leading to the clearing skillfully concealed traps are planted, usually a pit containing a sharpened stake on which anyone stumbling into the trap will be impaled.

Their bravery in battle is almost entirely due to the belief that they have enslaved the spirits of their dead foes, and likewise will receive aid from their departed forefathers. The latter appear to them in dreams induced by drugs made from narcotic plants that grow wild in the forest. Under the influence of the dope they wander through the jungle, listening, they believe, to the spirits of the dead, who give aid and advice.

The heads used as trophies must have come from a member of a rival tribe, as those of one's own tribe are supposed

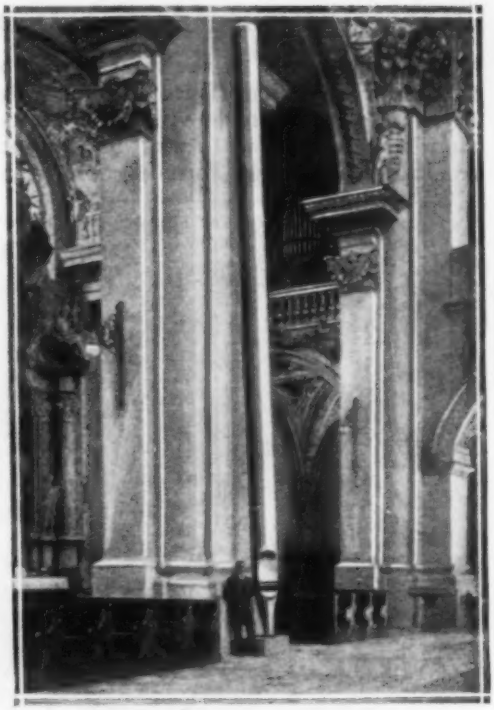
under the hanging vines for the passing canoes. Because of the jungle and the maze of streams, the natives have been able to resist not only other natives but likewise white invasion. Fruit, nuts and some rubber are the chief products in their domain, and they have not sufficed to tempt many traders into the interior.

VEGETATION GIVES OFF LIGHT DURING PROCESS OF DECAY

At a certain time in the fall of the year, beech and oak leaves give off a faint glow when they begin decaying. The glow occurs in tiny fibers interwoven in the leaf which are essential to its health although they do not start glowing until the leaves are dead or dying. Examination of the underside of a beech leaf reveals small yellow spots, the centers of the fibers. If these are disturbed with the point of a pin, they will shine more brightly for a few moments. Glow has been recorded at various times from grasses, the lily, a species of poppy and the common nasturtium, but special apparatus is needed to detect these faint lights. There is a kind of luminous moss which may be seen in crevices among large stones and rocks by the roadside, and the roots of the tormentil give off light when the soil is removed.

AUTO STOP-AND-TURN SIGNAL PROMOTES SAFETY

Signals for right or left turns and stops are given from a compact accessory attached to the rear of the auto and operated by two switches. The one that controls the stoplight, in the center, is manipulated automatically by the car brake. The direction indicators, consisting of an arrow for left turns and a pointer of slightly different shape for right, are illuminated by throwing a switch on the steering column near the wheel. The separate operation of the lights is intended to reduce confusion and make each signal more clearly visible.



Huge Pipe for Organ in German Cathedral Compared with Height of Archway

SINGLE PIPE FOR BIG ORGAN THIRTY-SEVEN FEET HIGH

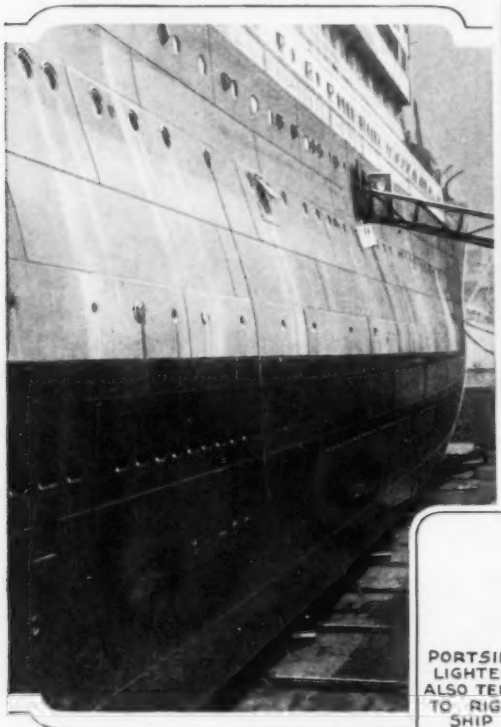
Weighing nearly 650 pounds, one of the large metal pipes for a huge organ now in course of construction in the cathedral at Passau, Germany, is thirty-seven feet high. The organ takes it place as one of the largest instruments of its kind in the world.

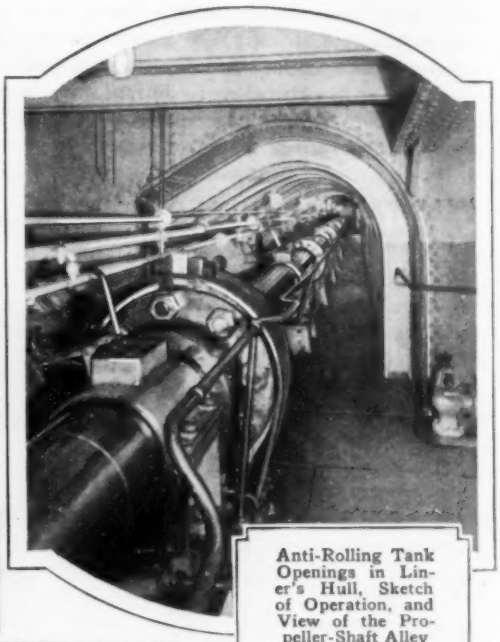
MAKE COAL FLOW LIKE LIQUID BY HEATING PROCESS

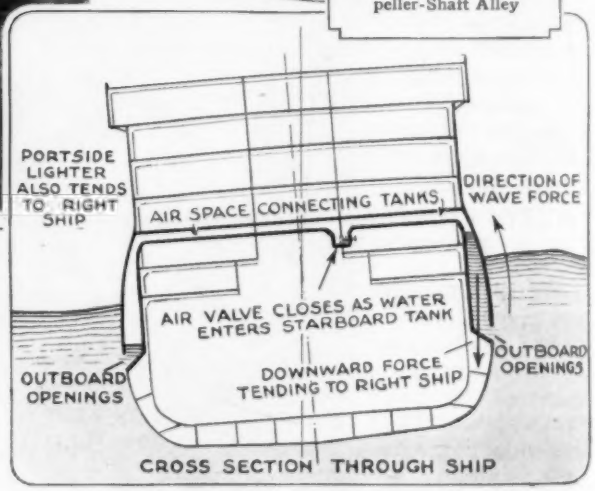
Pulverized soft coal can be made to run and seek its own level like a liquid by application of heat, according to an eastern expert. He explains that the warming causes the liberation of vapors or gases, which form tiny bubbles about each fine particle of coal, reducing friction and causing the mass to flow. The condition lasts as long as the vapors are issuing from the particles. It is pointed out that a general application of this principle would result in great changes in mining and combustion methods as well as in the transportation of the commodity.

WAVE FORCE HARNESSED TO PREVENT SEASICKNESS

Using the power of the waves to keep the ship from rolling is accomplished with a system of tanks installed in a new German liner, the "New York," to prevent seasickness. Bulges formed along the sides of the ship provide a space between the main hull and outer skin. Rows of rectangular openings admit the sea in this space, the bulges being connected at the top with an air pipe across the ship. When a wave strikes one side of the ship and starts it to rolling the pressure of the sea drives water up in the tank, raising its level and increasing the weight on that side. The air forced out by the incoming sea passes through the connecting pipe and drives water out on the other side, lightening it, so that the ship has a tendency to go back to an even keel. The connecting pipe is fitted with an air intake valve to admit air into the tanks from above, but the valve closes under pressure from within and prevents air escaping. The ships are fitted with propeller-shaft tunnels of a new design so that the full length of the driving shaft is easily accessible for oiling and inspection.






PORTSIDE LIGHTER ALSO TENDS TO RIGHT SHIP
AIR SPACE CONNECTING TANKS
DIRECTION OF WAVE FORCE
AIR VALVE CLOSES AS WATER ENTERS STARBOARD TANK
DOWNWARD FORCE TENDING TO RIGHT SHIP
OUTBOARD OPENINGS
OUTBOARD OPENINGS
CROSS SECTION THROUGH SHIP

Anti-Rolling Tank Openings in Liner's Hull, Sketch of Operation, and View of the Propeller-Shaft Alley

LOSS OF SLEEP AIDS BRAIN BUT FATIGUES BODY

Cutting off two hours of sleep each night, makes the brain more alert but is a considerable drain on the body, tests at Colgate university have shown. The

experiments were conducted with three young men. Materials used included alarm clocks, a stop watch and an apparatus to measure the consumption of oxygen. To arrive at a working basis for the investigation, the subjects were drilled for weeks in mental multiplication. Fifteen problems were solved each day at a single sitting, while the time required and the errors made were recorded. When a "performance level" had been reached, a point beyond which there seemed to be little likelihood of improvement, the subjects were placed on a strict sleep allowance of eight hours nightly and the results of their problem working again recorded. Then they were tested with but six hours of sleep. With this amount of time devoted to slumber, all showed an improvement in their mental work, but the amount of energy expended when doing the problems increased enormously as compared to that spent when eight hours of sleep were allowed.

HAUL TRAILERS ON FLAT CARS TO SPEED SHIPMENTS

Saving in time and expense by reducing the handling of less than carload shipments to a minimum is expected from an innovation in traffic introduced on a mid-western electric line. Auto trailers, loaded for city distributing, are sent on flat cars without taking off the wheels so that they can be quickly removed at their destination and hauled about the town with their load already arranged for delivery to the purchasers. A central station where the trailers are filled further expedites matters.

Trailers on Board Flat Car for Electric-Railroad Journey; at Destination They Are Hooked to Truck

SPECIAL SIGNS GUIDE TOURISTS TO CITY'S HISTORIC SPOTS

Telling the Motorist What to See; Handsome Signs Erected at Street Intersections to Guide Tourists

More than forty decorative signs, lettered on both sides and easily legible from a distance of sixty to seventy-five feet, have been erected at street intersections in Marietta, Ohio, to direct visitors to interesting places in the city. They are of the finish of antique bronze and the metal characters are faced with gold leaf. Arrows point in the direction of the place described, and the distance is given in blocks. The signs are of uniform pattern and are placed on substantial concrete posts, which also bear the name of the street in clear letters.

¶The Popular Mechanics Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.

Aiding Travelers at a Forest Crossroads in Germany; the Guide-Post Sentinel

NOVEL THREE-ARMED SIGNPOST HAS FACE OF MAN

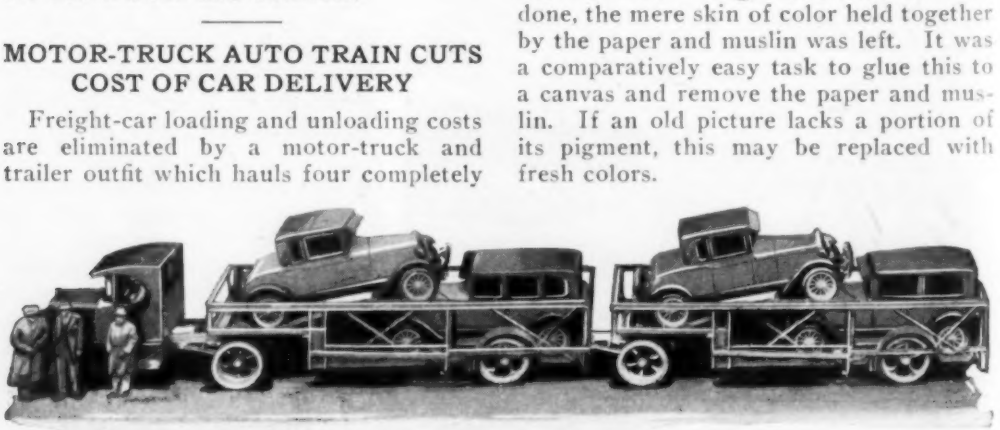
Travelers through one of the forests in Germany are directed on the proper way by an odd signpost representing a man. Its outstretched arms bear legends giving the destinations and distances.

MOTOR-TRUCK AUTO TRAIN CUTS COST OF CAR DELIVERY

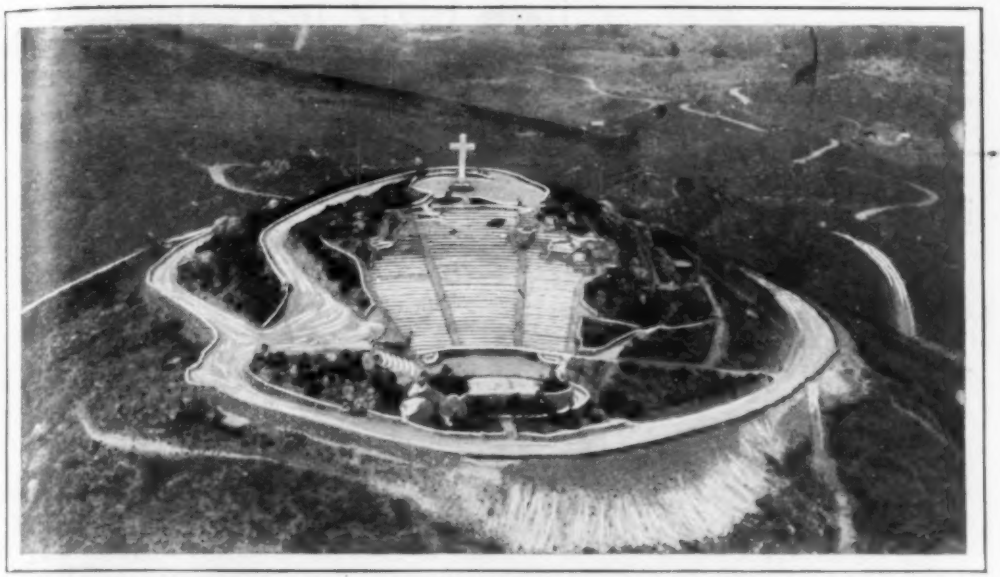
Freight-car loading and unloading costs are eliminated by a motor-truck and trailer outfit which hauls four completely assembled automobiles directly from the factory to the dealer. This method insures the delivery of an absolutely unused car, is said to reduce transportation time, and, as one man can drive the "train," operating costs are not high.

OLD PAINTINGS ARE RESTORED BY FEATS OF EXPERTS

Almost unbelievable feats are performed by men who restore old paintings. One of the first things the worker does in repairing a picture with a canvas torn, cracked or rotted with age, is to purchase a new canvas. A sheet of Manila paper is glued to the painted side and the old canvas is then carefully scraped away. When all the fabric is off, the grounds upon which the paint lies are removed by solvents or gentle scraping until nothing remains of the original but the fragile shell or pigment adhering to the paper. The new canvas is then covered with the strongest fish glue obtainable and pressed firmly down upon this shell. As soon as the painting is attached securely to its new foundation, the only step remaining is to take off the paper. This can be done with hot water. Haquin, a French artist, was, it is thought, the first to successfully transfer a painting on wood to canvas. He glued a sheet of paper over the surface of the painting and afterward upon this a layer of muslin. When the glue was dry, he planed down the panel until it was as thin as matchwood. Then he scraped off the rest with a long, flexible knife. This done, the mere skin of color held together by the paper and muslin was left. It was a comparatively easy task to glue this to a canvas and remove the paper and muslin. If an old picture lacks a portion of its pigment, this may be replaced with fresh colors.



How Autos Are Hauled Directly from Factory to Dealer by Motor-Truck Train; the Conveyance and Special Trailers with Load of Four Cars



Cross-Capped Stadium on Mt. Helix, near San Diego, Calif., Where Outdoor Easter Services Are Observed with Impressive Rites; There Are Seats for About 2,000 Persons

STADIUM BUILT ON MOUNTAIN FOR EASTER SERVICES

Near San Diego, Calif., a permanent stadium has been constructed on top of Mt. Helix, 1,380 feet above sea level, for the observance of special outdoor Easter services. Although it is used but once a year, it has been carefully built with seats of stone and steps of concrete. It will hold about 2,000 persons. A smooth dirt road leads to the top of the mountain.

HIGH-FREQUENCY SOUND WAVES DESTROY LIFE

That sound waves of extremely high frequency are capable of destroying life and cutting down the number of red blood corpuscles, has been demonstrated in experiments performed by Prof. Robert W. Woods, of Johns Hopkins university. He reported that a minnow was killed after two minutes' exposure to sound vibrations at a frequency of 300,000 cycles and, in fifteen minutes, the blood corpuscles in a mouse were reduced sixty-five per cent. The vibrations were produced in oil and passed through a quartz plate, striped with tin foil, into the receptacles which held the subjects. The experimenter does not believe that the sound-wave method will be used by sportsmen as a substitute for guns, as it cost $6,000 to kill the minnow and $45,000 to weaken the mouse. It is thought that the tests may shed some light on the effects of pernicious anæmia.

ELECTRIC BURNER FOR PAINT REDUCES FIRE RISK

As a substitute for the painter's blowtorch, an electrically heated unit, that may be operated from the lighting circuit, is said to be safer and more easily handled. A scraper can be attached to the frame so that there will be no need of using more than one tool to remove the coating.

HOW MUCH BLOOD?

If the weight of the body of a healthy man is divided by twenty, the result will be the approximate weight of the blood, according to the results of recent experiments. It is not known whether this formula applies as accurately to women.

Demonstrating the Sleep-Inducing Outfit; under the Black Band Are a Vibrator and Blue Light

LIGHT AND VIBRATOR BRING SLEEP IN EIGHT MINUTES

A French electrical engineer has devised an apparatus that is said to put a person to sleep in eight minutes. It consists of a black band containing a blue light which is placed over the eyes of the subject. Combined with this is a small vibrator. The effect of the illumination and the vibrations brought on sleep.

FEWER STORMS IN NOVEMBER WEATHER RECORDS SHOW

In the last forty years, only three tropical storms of true hurricane nature have been observed after the first of November. Since 1886, nearly 250 storms of the hurricane type have occurred, although, of this number, only 128 have attained true hurricane force. About eighty-eight per cent of the winds occur in the months of August, September and October.

INVISIBLE RAY WILL GUIDE TRAINS AND PLANES IN FOG

Greater safety for aviators in fogs and less likelihood of train collisions are promised through the application of rays of light invisible to the eye yet capable of actuating signals miles away from their source. According to an electrical research worker, these rays could be projected thirty miles into space and controlled as to direction. Their function in guiding the planes would be to register signals on a photo-electric cell mounted on the pilot's instrument board. For the purpose of this signaling, the inventor is said to have devised a special tube which becomes fluorescent in response to the controlled rays. Adapted to railroad use, the cell would show light only at the close approach of another train.

TRAILER CAR FOR MOTORCYCLE HOLDS KITCHEN AND BEDS

Space for two beds, cooking and other equipment is provided in a trailer attached to a motorcycle. Designed especially for short camping expeditions, it has sturdy wheels for travel over rough roads, and is so connected to the cycle that it does not jolt any more than the ordinary trailer.

The Trailer Bungalow Hauled by Motorcycle

Totems Reveal Vivid Picture of Vanishing Race

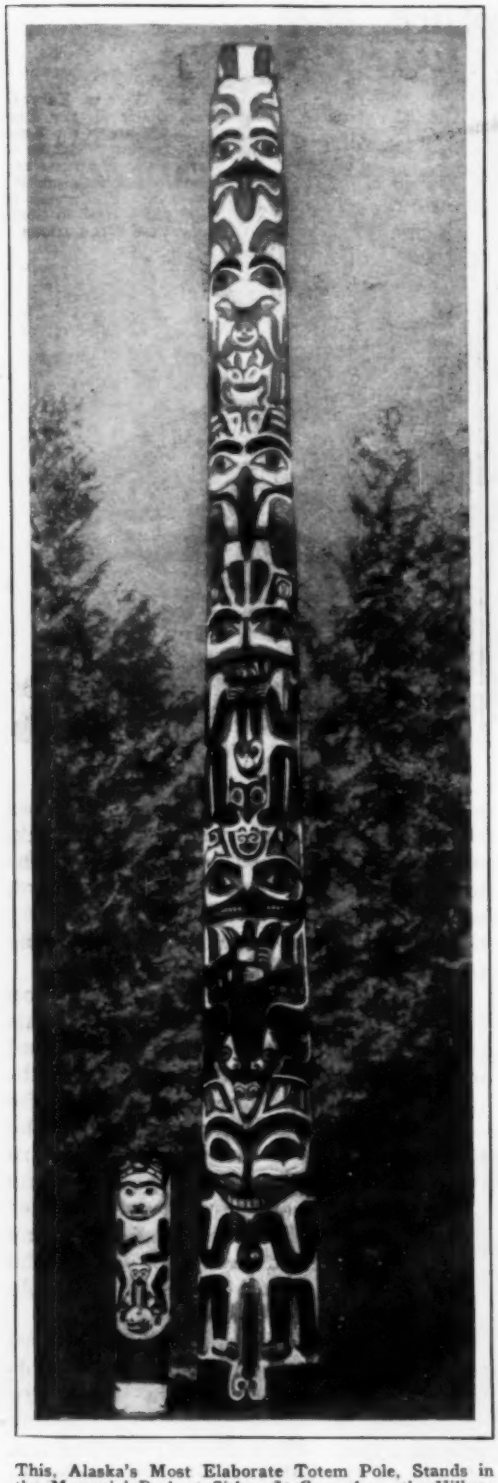
Houses Grow Ears to Grace Their Highly Decorated Fronts in the Kwakiutl Indian Villages of Alert Bay, Vancouver Island, British Columbia; Totem Art Is Carried to Its Highest Peak in Some of These Decorations

LIKE the vanishing race whose rare skill at carving has made them possible, the totem poles of the Alaskan Indians are rapidly disappearing through neglect and decay, and even outright destruction, and science seems unable to prevent it. This is the disclosure made by Dr. Herbert W. Krieger, of the Smithsonian Institution, in a lengthy report prepared for the government on the results of his efforts last summer to preserve some of the rarest products of totemic art in the southeastern parts of Alaska.

Dr. Krieger states that many of the villages are no longer occupied by their former inhabitants, while others show evidences of neglect because of the absence of their owners, who are working in the Alaskan canneries or are imitating the white man's ways and are living in new houses of sawed boards, leaving their ancestral homes, which represent the highest skill of the northwest coast Indian, to fall into decay. The wood carver's art of these tribes, Dr. Krieger says, has aroused wonder and admiration from the time of their discovery by the Russian explorer Behring, who first landed at what is now known as Sitká, Alaska, in 1741. Nowhere else in the world may one find a similar type of art, representing for the most part carved figures. The images are usually of well-known animals, such as the beaver, bear, killer whale, shark, hawk, eagle and raven, but there are also mythical creatures, such as the thunder bird, which is reputed to make lightning by the flash of its eyes and thunder by the clapping of its wings.

These carved figures find expression on the tall wooden totem poles chiefly, although house posts, dugout canoes and many other objects of daily use form subjects for carvings. The most striking bits of artistic efforts of the natives are on the tall columns of cedar wood, which are really memorials erected in honor of the male relative whose property the builder had inherited. These totem poles, some giantlike in height, generally occupy the place of honor at the center of the gable end of the owner's house.

Among the Tlingit and certain other of the coast tribes the totem pole has a hollowed cavity in the rear in which are placed the cremated remains of the one in whose honor the memorial was erected. Nearly all the poles standing at the pres-



This, Alaska's Most Elaborate Totem Pole, Stands in the Memorial Park at Sitka; It Came from the Village of Kasaan

ent time have such cavities. Among the Tlingit the name for totem pole is the word meaning "coffin"; its use and significance would make it, according to our notions, the equivalent for tombstone or memorial column.

Dr. Krieger found that the totem pole which once stood proudly before the house of a family or clan, and showed by its carvings the lineage and personal achievements of the residents, is fast succumbing to decay and ill use. Since the coming of white men, the Indians have lost their pride in tradition. One native cut down some finely carved poles to make a sidewalk. On the west coast of Prince of Wales island is the village of Kowkan, with fifty good totems intact, but this is far from the course of white men's travels and is uninhabited. Tongass village also has some unique totems. Three of these have the carved emblem declared by natives to represent Captain Cook, the first white man seen by their ancestors. One pole has a very fair likeness of Abraham Lincoln carved among its bears and eagles and ravens. The natives think probably that the chief who made it had seen a white man, an event worthy of preservation in native history, and had acquired a picture of Lincoln which he copied on his totem. It is also possible that the carver sought to record the purchase of Alaska by the United States, since one earlier totem has been found with what was probably a portrait of the Czar of Russia.

Any unusual experience in the life of the individual may be incorporated in the carvings on the totem pole. One has the carved figure of a ship under full sail, Dr. Krieger said. This pole belonged to a woman who was the first of her village to see such a vessel and the white men who landed at Sitka. A carved figure on another pole represents the experience of an Indian at Tongass village who once acted as host to a former secretary of the interior on his visit to Alaska. The secretary was asked to sit on a pile of fine furs in the Indian's house. At the close of the interview he was told that he was forgetting his furs. "It is the custom of our people," said the Indian, "that what a visitor sits upon is his."

When the totem pole was erected later by his nephew, the former secretary of the

At the Annual Elk Round-Up on a Massachusetts Farm; the Young Animals Are Being Roped and Separated from the Others to Be Put in Special Winter Pasture

interior was represented on it dressed in a frock coat, silk hat and checked trousers.

"Totem pole art," Dr. Krieger says, "is largely a representation of animals. These usually refer to the role played by certain animals as actors in native myths. The curved beak of the hawk is invariably represented as touching the mouth on the underside, while the thunder bird, which wears a cloud hat, has a larger beak. The raven has a long straight beak, while that of the eagle is short and curved. Birds, even when they take human form, are to be recognized by a beak added to an otherwise human face. The beaver usually is biting a stick, which it holds between its paws. Certain mythical water monsters may take on a variety of forms. Animal representations have erect ears placed above the eyes, but are otherwise hard to distinguish from human figures.

"The most important thing in the life of the Indian is his crest or totem. Representations of this animal crest are placed on every conceivable object of daily use; they are even tattooed on his arms and body and are painted on his face. The inheritance of a proper kind of crest determines an individual's chances of success and standing in his community."

ELK ROUND-UP IN NEW ENGLAND SHOWS ROPER'S SKILL

Capturing elk with a lasso suggests a picture of the wild west in one of its wildest phases but the reality is found in Middleboro, Mass., and the lariat thrower is a Yankee "cowboy." The scene is on an elk farm where, once a year, the animals are separated from the rest of the herd, as winter approaches, and placed on a special range. They are also given a specially selected diet which consists chiefly of milk.

ARCTIC COAL TO BE SENT BY AIR AVIATOR PREDICTS

Coal will be shipped to the United States from the Arctic by airplanes within the next forty years, Lieut. Comm. Richard E. Byrd, first aviator to fly over the North Pole, believes. He bases his prediction on the opinion that flying machines of sufficient safety and power for heavy commercial use will soon be produced. Incomplete surveys have revealed that there are millions of tons of coal in Alaska and huge fields of the fuel in other parts of the Arctic.

ANCIENT INDIAN COMIC MASK RIDICULES BOASTER

The Braggart Was Disliked Even in Early Times; Comic Indian Mask Ridiculing Boasters

Suggesting the cartoon of today, a grotesque mask was made by an Indian tribe to symbolize the boastful warrior, who, on returning from an expedition, tired his auditors with repeated tales of his own prowess. The image, made of wood, delivers its message by the emphasis of a single feature—a huge mouth. The mask has been exhibited in the Museum of the American Indian in New York city.

MOTOR FUEL FROM COAL TAR MADE BY NEW PROCESS

Soft-coal deposits in the United States can supply the world's need for motor fuel for the next 800 years, an oil expert declares. He reports the development of a "cracking" process by which tar from bituminous coal is converted into motor fuel of high anti-knocking properties. He estimates that there are 1,600,000,000,000 tons of soft coal in the United States. From this 800,000,000,000 barrels of tar could be produced, sufficient to yield 240,000,000,000 barrels of fuel.

SIDE SEATS IN STREET CAR STONE-AGE HERITAGE

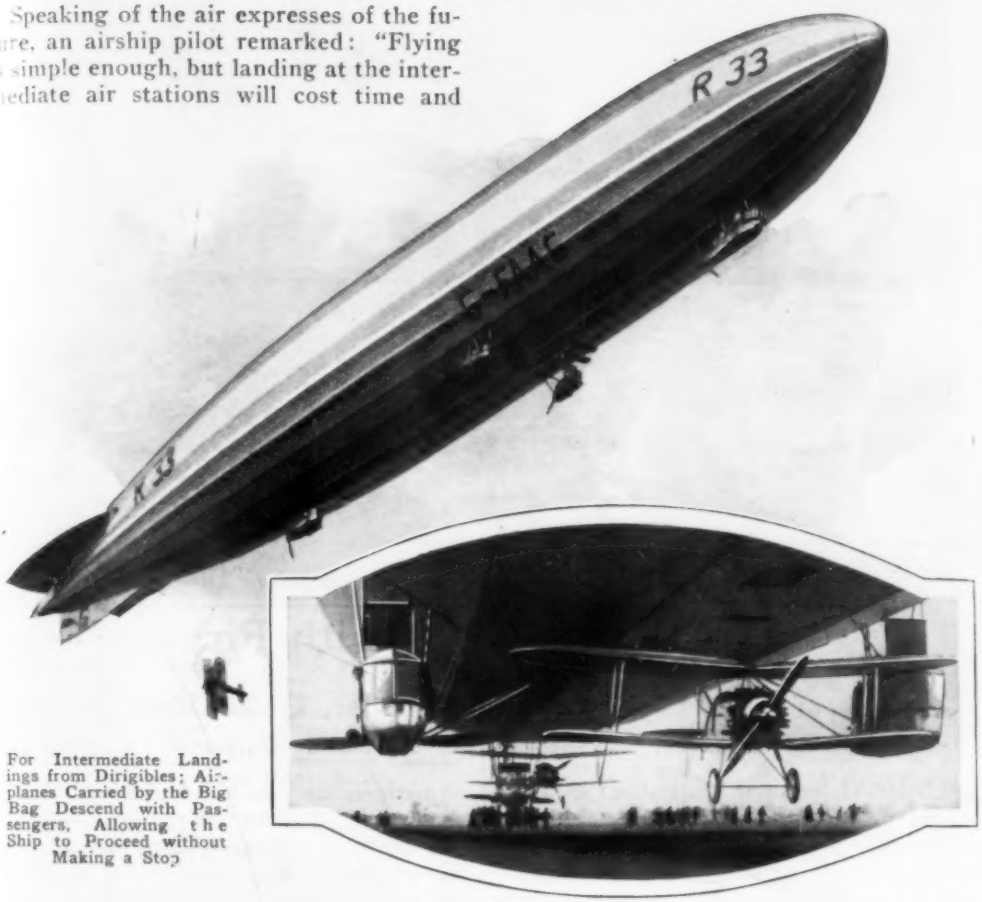
Side seats in street cars are popular because of an ingrained preference that comes down from stone-age days, according to Dr. Edwin B. Twitmyer, psychologist of the university of Pennsylvania, who has made a study of the habits of car riders. William James advanced the theory that men prefer to sit with their backs to the wall because their ancestors placed their backs against a rock or tree so that they could not be attacked from the rear. For the same reason, Dr. Twitmyer says, people put their beds near the wall, and make the headboard higher than the footboard. Car riders prefer seats near the door because of the added sense of security or, in some cases, because they want to efface themselves from notice as quickly as possible.

TRANSFORMER IN LIGHT SOCKET RUNS SMALL BULBS

Tiny electric bulbs such as are used in physicians' and dentists' equipment can be lighted from the house circuit through a transformer that is connected directly to the light socket. It reduces a 110-volt current to two and one-half volts and is said not to heat up, even if used continuously. A small bulb can be operated for thirty-six hours at a cost of a cent or so, the manufacturers assert. Tips on the transformer make it easy to connect the cords to the small lamp unit.

PLANES LAUNCHED BY AIRSHIP MAKE SAFE LANDING

Speaking of the air expresses of the future, an airship pilot remarked: "Flying is simple enough, but landing at the intermediate air stations will cost time and money." Speed is the most valuable feature of air-borne passenger and mail traffic, and every landing means a considerable delay. To solve this problem, the British air ministry recently made some spectacular experiments.



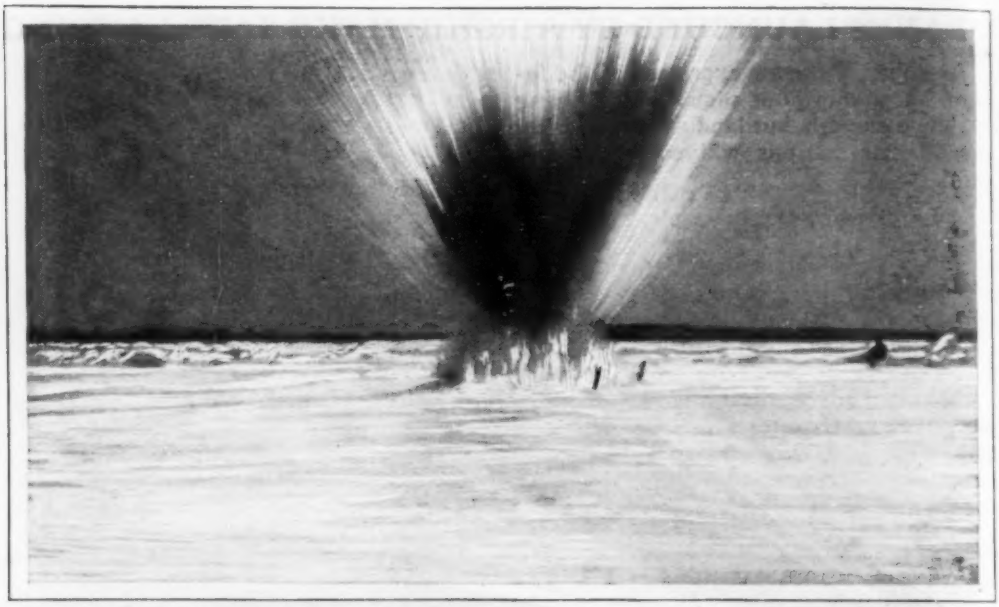
For Intermediate Landings from Dirigibles; Airplanes Carried by the Big Bag Descend with Passengers, Allowing the Ship to Proceed without Making a Stop

Under the hull of an airship two airplanes, weighing over a ton each, were suspended. The ship took the air, and when an altitude of about 2,000 feet had been reached, the pilots of the planes entered them by means of short rope ladders. The engines of the planes were started, a pull on the control lever freed them from the slip hook from which they hung and in a steep dive the machines parted from the mother ship. In a few moments, the planes straightened out and made a perfect landing.

In wartime, fighting machines can be released from the airship to protect it from attacking enemy craft. Peaceful aviation also benefits largely by such experiments, for they seem to have proved that it is possible to land safely from an airship proceeding at full speed.

TINY FLAGS PROTECT GARDENS OF JAPAN FROM BIRDS

To keep marauding birds from seeds and young plants, Japanese gardeners use an effective adaptation of the familiar scarecrow. They stake off the field with lath and common wrapping cord into squares about twenty feet wide, and on the strings they attach small strips of cloth or paper. These tiny pennants flutter in the breeze and the continual motion keeps the birds from the patch.



The Shot Which Dislodged the Chimney Island Ice Jam in the St. Lawrence River, March 13, 1925; Reaction of a Ninety-Pound Thermite Charge Moved 1,000,000 Pounds of Ice

Fighting Icebergs with Fire

Charges of Substance Producing Intense, Quick Heat Shatter Frozen Masses That Menace Ships

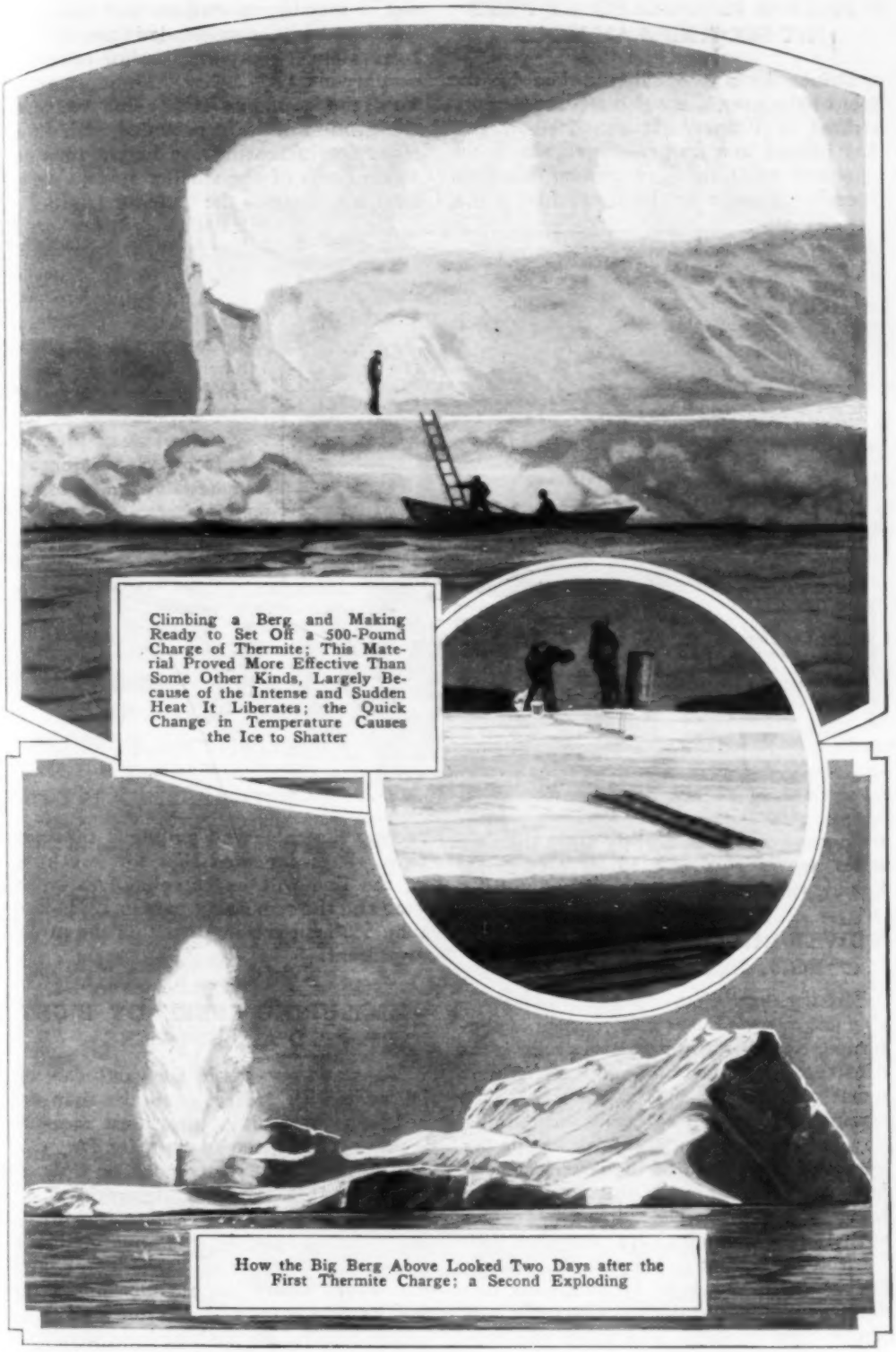
SEVERAL popular ideas about icebergs have been upset and an effective way to destroy the huge wanderers for the protection of shipping has been demonstrated by Dr. Howard T. Barnes, of McGill university, who has made seven expeditions in northern waters in the interests of science and navigation.

Tests with sensitive thermometers disclosed that often the surface water near a berg is warmer than that farther away. The ice mass acts as a sort of pump, sinking the surrounding sea water by cooling and drawing to itself the warmer surface water, thus contributing to its own destruction. This rise in temperature was noticed as far as five miles from a berg.

Other measurements showed that from one-sixth to one-tenth of the volume of an iceberg consists of air, hence the density is such as to make it float out of the water much more than ordinary hard ice. According to Dr. Barnes, the common statement that nine-tenths of an iceberg is under water is not always true, for sometimes as much as one-half of the mass may be above the surface.

Chunks of icebergs placed in hot water, hissed like frying bacon owing to escaping air. Samples of the air were analyzed and found similar to the atmosphere today, indicating that there has been no change in the air over the earth since the snowflakes fell on the Greenland ice cap, possibly 5,000 years ago. Where the air bubbles predominate, the color of the berg is white, while blue veins in it are due to the absence of air.

A material that would give a high temperature in the shortest time was found in thermite, a combination of aluminum and iron oxide, widely used for welding and other purposes where great heat is desired. The effectiveness of this substance was demonstrated in the winter of 1924-25, when Dr. Barnes used it to blow out an ice gorge in the Allegheny river. An expedition last summer succeeded in destroying two icebergs with thermite and further tests are planned.



Climbing a Berg and Making Ready to Set Off a 500-Pound Charge of Thermite; This Material Proved More Effective Than Some Other Kinds, Largely Because of the Intense and Sudden Heat It Liberates; the Quick Change in Temperature Causes the Ice to Shatter

How the Big Berg Above Looked Two Days after the First Thermite Charge; a Second Exploding

FLOATS PROPELLED BY FEET AT SIX MILES AN HOUR

Driven by a propeller worked by the feet of the user, a novel craft was demonstrated in France. It consisted of two floats fitted to a framework on which the operator rests in a swimming position. Steering is done by the front float and a rudder. A speed of slightly more than six miles an hour is said to have been attained without difficulty.

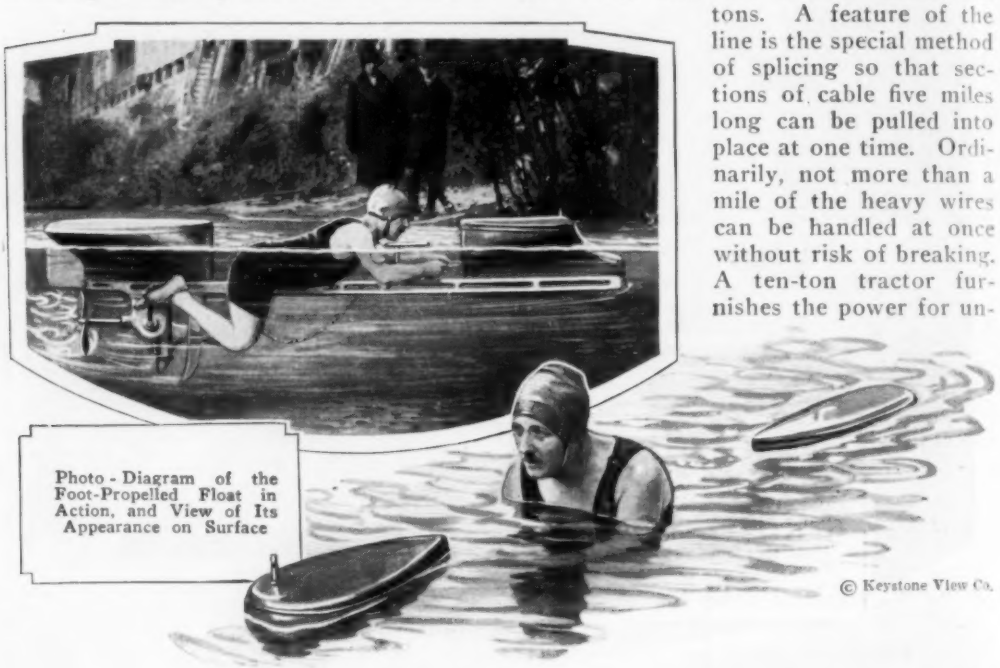


Photo - Diagram of the Foot-Propelled Float in Action, and View of Its Appearance on Surface

© Keystone View Co.

POWER-LINE BUILDING RIVALS ROMANCE OF RAILWAY

The big days of railroad building probably are over so far as this country is concerned, transportation experts declare, but construction projects, in some respects as remarkable as any that characterized the blazing of the railroad trails, are under way in the growing network of power lines and their rows of high steel towers. Such an undertaking is the 223-mile line being strung from the snowy fastnesses of the high Sierras into Los Angeles. Unlike the railway, it is being built through the roughest and most mountainous territory available in order to reduce the cost of the right of way. The cable will consist of fifty-four aluminum and seven steel wires and will be suspended from 826 steel towers and twenty-one anchor towers set seventy-six rods apart. The former will hold the conductors fifty-five feet from the ground and are provided with extensions for increasing the height to ninety feet. Each of the smaller towers weighs five tons, and the anchor units ten tons. A feature of the line is the special method of splicing so that sections of cable five miles long can be pulled into place at one time. Ordinarily, not more than a mile of the heavy wires can be handled at once without risk of breaking. A ten-ton tractor furnishes the power for unreeling the cable and pulling it into position. It is expected that the south half of the line will be completed early this year and the remaining part in 1928. More than 500 men are employed on the project at present.

MEASURING SPEED OF LIGHT TO AID SURVEYS

Maps and surveys of the earth can now be made with greater accuracy than ever before as a result of the latest measurements of the speed of light by Dr. A. A. Michelson of the University of Chicago. He points out that by determining the time it would take for light to travel from one point to another, it is now possible to measure a distance of 100 miles or so in two weeks where the old methods would require two years and still not give as accurate results. By flashing light rays from

revolving mirrors between Mount Wilson and Mount San Antonio in California, a distance of twenty-two miles, Dr. Michelson computed that the speed of light is approximately 299,796 kilometers (186,284 miles) a second. This rate is slower by some miles than previously had been believed. Five sets of mirrors were used to reduce the chances of error. They gave equivalent results. By repeating the measuring experiment over a greater distance, the scientist expects to achieve an even more accurate figure.

CHAIR HAS RACK FOR UMBRELLA AND SHELF FOR HAT

Theater patrons have individual "check rooms" in a chair fitted with a rack on the back that holds a coat, a bracket at the side for the umbrella and shelf space underneath for the hat or for parcels. The coat holder projects but a short distance from the back of the seat and is arranged to prevent the garment from becoming mussed up by the occupant of the seat behind.

The Wardrobe Chair, Showing How the Various Articles Are Stored

¶Names and addresses of manufacturers and dealers in articles described in Popular Mechanics, and any other details, will be promptly furnished by our Bureau of Information.

FRONT DRIVE GIVES SOLUTION FOR LOW RAKISH CAR

Success of front-wheel drive on several racing cars during the last two years offers a solution of the problem of a low-hung car which will cling to the road, the elimination of steps and the necessity of climbing up to a seat, and removes the difficulties in the way of real streamlining, with true "tear-drop" bodies. Continental designers are already working on custom-built cars in which all of these problems have been met. The propeller shaft running from the engine to the back axle was the one big obstacle in the way of low-slung cars, with the center of gravity below the center of the wheels. The front drive has no propeller shaft, and therefore needs no back axle, the wheels being capable of side suspension. A section view of such a car, designed in England, shows how the tear-drop body can be carried back with smooth lines in a tail that incloses gas tank, spare tire and luggage compartments, the latter two being reached through a trapdoor in the car roof, which at this point is as low as the rumble seat of a roadster. This type of car could take turns at very high speed, and even in a sharp skid would have little tendency to turn over.

An English Idea for a Streamlined Body on a Front-Wheel-Drive Car; Notice How the Elimination of the Rear Axle Helps Bring the Body Down for a Low Center of Gravity

For Quick Answers to Fire Alarms; German Motorcycle Outfit with Sidecar That Has Separate Motor

SIDECAR ON CYCLE FIRE ENGINE RUNS ON OWN POWER

For fighting fires, a special motorcycle, exhibited in Berlin, is really two vehicles in one, as the sidecar, containing the apparatus, can be detached from the cycle and made to run by its own motor. Additional wheels enable this operation.

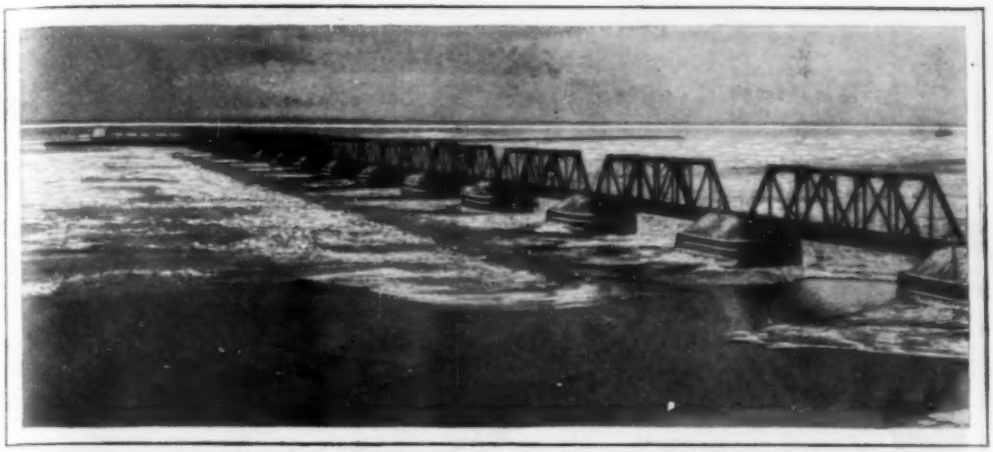
ELECTRICAL "PLOT" FOR OPERA CAREFULLY PREPARED

Besides the theme which the singers develop on the opera stage, there is another plot that the public witnesses through the work of hidden actors who are sometimes almost as essential to the success of the scenes as the principals. This is the plan of electrical lighting to accompany the music, which indicates just when certain buttons or switches are to be pulled for the special electrical effects. The chief electrician is in charge of this inner play. When a cue is reached, he presses a button and a light or buzzer signal relays word to a helper at some far part of the stage that it is time for him to operate a spotlight, raise or lower a curtain or perform some other task. At the Metropolitan Opera house in New York, a man sits in the cellar with his head through a hole in the stage but out of sight of the audience. When he receives his cue, he signals through a speaking tube to an electrician at his feet who operates the lighting switches for the stage. During rehearsal, the chief electrician, stage manager and scenic artist watch the effects from the rear of the house. They communicate with the stage by means of telephones.

MOVE HOTHOUSE MANY MILES WITHOUT BREAKING GLASS

Movers achieved another triumph recently when they rolled an eighty-foot greenhouse in Los Angeles to a new locality, twelve miles distant, without breaking a single glass in the structure. The roof and sides were carefully braced.

Greenhouse on Wheels Showing Bracing That Saves Glass



Bridge and Artificial Island Built in Hudson Bay, at Port Nelson, to Furnish Protection for the Harbor; Steel and Concrete Piers Resist the Ice and Break Up Jams

Bringing Europe a Thousand Miles Nearer to America by Rail

By EARLE W. GAGE

ADVENTUROUS engineers are pushing a pair of steel ribbons through the wilderness of the northland which will bring Europe 1,000 miles nearer America, cut off more than 3,000 miles on the journey from Europe to the Far East, and unlock billions of wealth, hidden behind the barrier of waste stretching between Hudson Bay and civilization.

The great transcontinental railroads of the past generation opened vast empires to development, resulting in the settlement of the American continent, but the new Hudson Bay railroad is destined to transform the travel between two hemispheres, vitally affecting the millions of Asia and Europe who look to the vast central American plain for food and clothing.

This 425-mile link that is being forged onto the great American railroad chain will connect more than 20,000 miles of trunk lines with the shortest possible route to Europe, besides tapping the Great Lakes waterways and connecting them with foreign markets. Although it will cost more than $20,000,000 to push this road from the end of existing steel to Hudson Bay, and more than $6,000,000 to construct the harbor, docks and warehouses at the mouth of the Nelson river, engineers estimate that the original investment will be returned to the Canadian government at the end of ten years, due to elimination of the long haul halfway across the continent, in order to reach transatlantic steamers.

Canada's great inland sea, Hudson Bay, gives the vast interior region a central outlet to the Atlantic and to world markets. Although this region is often associated with arctic conditions, no part of it comes within the polar circle, and a report says with assurance, "that ships may enter and leave Port Nelson all the year around." The northern part of the bay is in about the same latitude as the highlands of Scotland, while Moose Factory, on the southern shore, is only a trifle north of London. The temperature of the water of the bay is several degrees higher than that of Lake Superior, and it has a mitigating influence on the climate of the vast territory which immediately surrounds it.

Though Hudson Bay remains open, Hudson strait freezes over. Thus, transportation will be possible for only four months of the year, but the saving in cost and time from the freight traffic in the summer will justify the construction of the railroad. During the closed season,

Hundreds of Miles of Virgin Wilderness, or "Bush" as the Canadians Call the Forests of the North, Is Penetrated by the New Railroad in Its Long Run to Hudson Bay

the enormous resources of the region, including farm crops, timber, paper-pulp stock, minerals, and the large wealth of fur, will provide freight business.

Now the bulk of the wheat sent from central America to European markets must pass through the bottle neck at the head of the Great Lakes, or over the more expensive long-haul freight route to the seaboard, when lake ports are locked by ice. This season of relief is only slightly longer than that provided by Hudson Bay's open water, and since the bay route offers ample facilities for seagoing vessels as far as Port Nelson, much larger cargoes can be transported in a shorter time.

The Hudson Bay district constitutes an area of 3,000,000 square miles, including every variety of soil and climate known to the temperate zone. The bay itself is 1,000 miles long, 600 miles wide at the widest part, and is the third largest inland sea in the world. It yields the northern whale, a single adult specimen of which is valued at from $10,000 to $20,000, and thirty kinds of edible fish. The large fur companies expend from $5,000,000 to $6,000,000 a year in the purchase of furs alone in this area.

To the south lie the fertile farming districts, to the west the grain belt, and, just beyond, the vast cattle-range country. Forests cover millions of acres.

Only recently a man discovered the Belcher islands and also found them veritable iron mines. A geologist estimates the iron resources of these islands to be not less than 200,000,000 tons and even more ore is in sight in the Nastapoka islands.

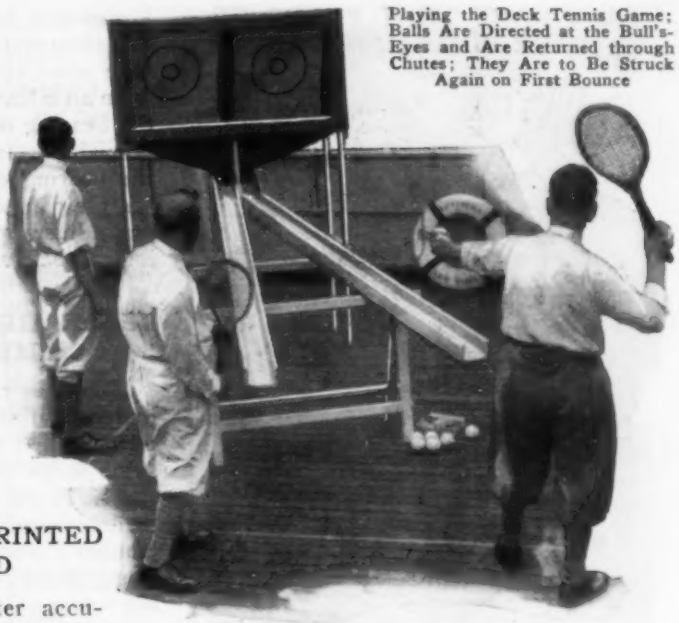
Since these islands lie but a few miles from shore, where water power is available and harbor facilities are provided by nature, their value is great, and many claims have already been staked in anticipation of the day when mills will start.

From Winnipeg, metropolis of western Canada, via Hudson Bay to Liverpool, is 3,620 miles, and via Montreal, 4,228 miles; Duluth, via Hudson Bay to Liverpool, 3,728 miles, and via New York, 4,201 miles. Such interior grain-storage points as Brandon, Regina, Calgary, Prince Albert, Edmonton and Saskatoon will be brought from 1,061 to 1,296 miles nearer to Europe's markets with the opening of the Hudson Bay route. On the other hand, Port Nelson is 2,925 miles from London, while Montreal, via Belle Isle, is 2,761 miles, and via Cape Race, 2,927 miles. However, the Hudson Bay route effects an average reduction of 1,000 miles to tidewater, without increasing the ocean distance to world markets.

CRUDE-OIL PIPES RIFLED INSIDE FOR BETTER FLOW

The principle of the rifled gun is sometimes applied to pipes for pumping oil when the fluid is extremely thick. Heat cannot successfully be applied to a long

conduit, and mixing with too much water results in an emulsion from which the oil cannot be readily separated. Flowing through a rifled pipe, the oil, to which is added a quantity of water, is caused to whirl rapidly. The water, being heavier, seeks the outside and forms a thin film between the oil and the inner side of the pipe. Friction is thus reduced, and with this system, the oil and water issue separately at the end.



Playing the Deck Tennis Game; Balls Are Directed at the Bull's-Eyes and Are Returned through Chutes; They Are to Be Struck Again on First Bounce

BUS-RIDE TICKETS PRINTED AS FARE IS PAID

To make possible greater accuracy in the collection and counting of fares on motor-bus and inter-urban-car lines, a register issues tickets and keeps a record of them for checking with the receipts. As passengers enter, they are given a ticket from the machine which stamps the slip to show the date, class of fare, amount paid, number of station and other data. The ticket is handed back to the operator when the passenger leaves so that it can be compared with the record which has been left in the register. Furthermore, the attendant also is enabled to tell by the ticket if the person has ridden beyond the point to which he originally paid his fare and thus collect any balance due.

Issuing a Ticket from Register; Machine Keeps a Record of the Fare for Future Auditing

BULL'S-EYE TENNIS ON LINERS LATEST MARINE SPORT

For the amusement of ships' passengers, a modified tennis game has become popular and is considered practical, too, as it affords an effective means for players to keep in training while on long voyages. Instead of a net, a target-and-chute apparatus is used. The balls are aimed at bull's-eyes in a frame, fall back through the runway and are to be struck again toward the target on the first bounce. Score is kept by a system of points based on the accuracy of the shots and successful returns without touching the ball with the hands.

COUNT INSECTS ON FRUIT TREES WITH STICKY PAPER TRAPS

Sticky fly paper serves government experts in the war on insect pests that menace fruit and other trees. Placed in screen boxes, it is held under the branches of a tree and the limbs shaken. The insects caught on the paper are counted, so that the investigators can determine accurately at what time of year the bugs are most plentiful. The traps have been used for two seasons in studies of insects that attack orange and lemon trees.

BABY CART THAT FOLDS UP CARRIED AS HANDBAG

Gocart, Unfolded and Collapsed, Showing How It Can Be Carried as a Handbag

Weighing only fourteen pounds, a collapsible cart for the baby is folded up in the form of a handbag for carrying. Saving of storage space and ease in going up and down stairs are among the advantages claimed for it, while comfort and safety are assured the infant when the carriage is in use.

SELF-ADJUSTING AUTO BEARING INVENTED BY PRISONERS

A self-adjusting connecting-rod bearing that automatically takes up its own slack has been patented by two prisoners in the Utah state penitentiary. The bearing is springless, working on a cam principle. The two inventors worked out the idea in the prison machine shop and applied it to all the cars and trucks used at the penitentiary, as a practical test before getting their patent. Previous to that, however, it had been run for thirty hours in a shop test with no lubricating facilities save what could be supplied occasionally from an oilcan. Despite this grueling test, the bearing is said to have shown no appreciable wear. Because of its nature, the bearing does not require burning or scraping in, and as it takes up the wear and adjusts itself, a car with a new bearing can be closed and driven away at once.

SUGAR AIDS MUSCULAR ENERGY CLIMBING TESTS SHOW

Mountain climbers often experience an increased desire for sweets and some, who never touch such things at home, consume large quantities when they are on tours. A test was performed not long ago to determine what effect sugar had on a climber's muscular energy. The subject was ignorant that an experiment was being made. On one day, he was given liquid sweetened with sugar and, on the next, a similar liquid sweetened with saccharine to make it taste like the other. It was found that a greater amount of work could be accomplished on the days when the sugar was given. Workers in the sugar-cane regions depend to a large extent upon the juice of the cane for nourishment. One investigator found that eight and three-fourths ounces of sugar a day increased his work capacity from twenty-two to thirty-six per cent.

WRIST WATCH AS ALARM CLOCK SERVES AS REMINDER

Attachable to the ordinary wrist watch with but little change of the mechanism, a revolving unit with protruding points that touch the skin when they turn, calls the attention of the wearer to a pending engagement or may awaken him, as the case may be. The equipment includes a timing apparatus by which the points are set to revolve at any hour.

FIND TWO COMETS IN ONE DAY ONE OLD, OTHER NEW

Finding a new comet on the same day as the rediscovery of an old one by the man who originally found it, was reported as an astronomical record recently. The new comet was observed by Dr. J. Comas-Sola, director of the Fabra observatory in Barcelona, Spain, and, following the practice of astronomers it will be given his name. It was seen early in the morning in the southeastern sky. As it is of the twelfth magnitude, it cannot be observed without a good telescope. About the same time, Dr. G. Neujman, at the observatory at Simeis, Russia, was picking up a comet he had discovered in 1916. He had calculated that it would come back every five and one-half years.

COAL DUST MIXED WITH CLAY PROVES GOOD FUEL

During the miners' strike, Englishmen learned new lessons in fuel economy. Coal dust, ordinarily considered too fine for furnaces, was rolled into balls with clay, to hold it together, and a coating of sawdust added to promote combustion and prevent the material from becoming sticky. The balls burned a long time and without forming clinkers, it is said.

Molding the Coal-Dust Balls; They Are Coated with Sawdust to Prevent Stickiness

Propeller Windmill and Air-Mail Light, Which Is Supplied with Current from the Mill

ELECTRICITY FROM THE SKY SUPPLIED BY WINDMILL

In place of the familiar wheel with its many blades, an improved type of windmill consists of a propeller, similar to that used on aircraft, and special gearing for driving an electric generator or for pumping water. The outfit is said to have much greater efficiency than the old apparatus, and, once installed, the wheel requires little attention other than two oilings a year. The electric generating plants are of a thirty-two and 110-volt type. One of the reasons that the propeller is so efficient, as compared with the ordinary wheel, is that the two working blades cut the air with the least possible resistance and deliver more power to the dynamo. The propeller is so controlled by the vane that it is deflected out of extremely high winds, automatically protecting the plant and equipment.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

A Fish That Apes the Birds; Nest-Builder in Its Home; This Species Also Changes Its Color

FISH BUILDS NEST OF WEEDS AND GUARDS EGGS

Among the peculiar kinds of fish is one that builds a nest of seaweeds and shore grasses around a stick or other anchored object. The eggs are laid in this shelter and are carefully guarded. The fish has the additional faculty of changing color like a chameleon to evade its enemies.

PIPE CARVER REVEALS SKILL IN MEERSCHAUM FIGURES

Vienna long has been the center of the meerschaum-carving industry but with the arrival in this country of one of a famous family of pipe makers, persons here have been able to see some of the cutting and finishing processes. The meerschaum is usually soft when first extracted from the diggings, most of which are in Asia Minor, but it hardens on exposure to warmth. After carving, the material usually is smoothed, heated in wax and given a high polish.

Otto Loder Cutting a Claw Design in Meerschaum Pipe Bowl; Several Tools Required for Delicate Carving

CITY HAS RADIO PHONES

Commercial wireless telephoning is already in use at The Hague, where a municipal system with more than 1,000 subscribers has been opened. The service is said to be successful. Tests have shown that radio-phone messages can be sent between New York and London, and regular operation is expected as soon as a tariff has been fixed. Experiments in transatlantic wireless telephoning have been conducted for more than three years.

ELECTRO-CULTURE MAY REPLACE FERTILIZER

Will electricity be used as a substitute for fertilizers in raising crops? Striking results, that seem to indicate the possibility of such an innovation in agriculture, are reported from Germany where the electrical treatment was used to grow oats, rye, barley, wheat, potatoes and other crops on an unpromising piece of land without any other fertilizers, natural or artificial. For comparison, precisely the same crops were sowed in an adjacent field and were not given the "electro-culture." They showed strikingly inferior results. A number of masts, some fifteen feet high, fitted with simple electrical apparatus were set up at various points on the lot. From a bar magnet placed across the top of each mast, a zinc-coated iron wire led over insulators into the earth and was continued underground parallel to the surface in the direction of the magnetic pole. Energy drawn from the air apparently stimulated the growth of the plants near the wires, the effect being noticeable from three to five feet on either side of the charged strand.

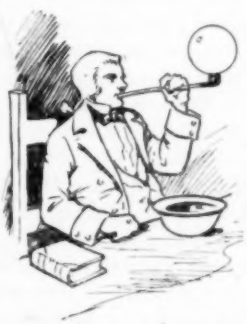
Things You Know—That Aren't True

Commonly Accepted Beliefs Prove That "the Exception" Does Not Prove the Rule

By J. EARLE MILLER

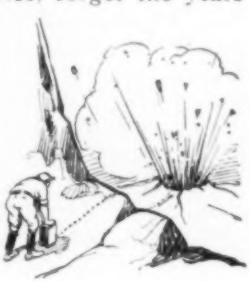
WHEN you discover that something you have always known isn't really so, you may think that "that's the exception that proves the rule"—but that familiar old proverb happens to be one of the well-known "facts" that aren't so.

The idea that the exception does prove the rule goes clear back to the days when an old Latin proverb was translated into English. "Probat" was translated into "proves"—which it may mean—but it likewise means "test," and that is the sense in which the Romans used it, so the proverb really is that "the exception tests the rule." The word is still used in English with the same sense, as for example the "proving grounds" at which cannon are tested. So what the exception really does is test the rule and prove thereby that it was not a true rule.



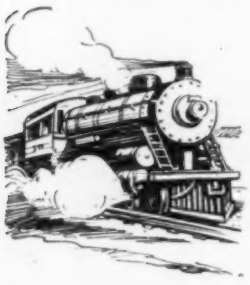
The commonly accepted beliefs that aren't true are almost numberless. Take the story that James Watt as a boy watched the steam lift the lid of his mother's teakettle, and so conceived the idea for the steam engine. Somebody executed an elaborate engraving picturing young James watching the teakettle bubble, and thereupon most everybody believed the story. What actually happened was that Hero of Alexandria, as far back as 130 B.C., had produced motion from steam and many men had invented crude steam engines, including Newcomen, whose devices were being used in mines before Watt's time. But they were all quite crude, and Watt, who was an instrument maker, being employed to repair a model of Newcomen's engine, conceived the idea of improving it—and built the condensing engine.

Another well-known "fact" that doesn't stand analysis, is the oft-quoted remark that most great discoveries are the result of accident. Watt's own discovery was really the result of a wide experience as an instrument maker and repairer for Glasgow university, plus close application to the problem of improving the Newcomen engine. Isaac Newton made some of his greatest discoveries by means of a child's toy—soap bubbles—but people who are amazed at the "accidental way" in which he made important discoveries playing with such a device, forget the years of deep study which enabled him to draw important conclusions from such apparently trivial phenomena. Many of his "discoveries" relating to light were painstakingly worked

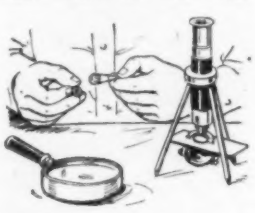


out through involved mathematical deductions, and then verified with bubbles.

The attraction of gravitation, according to the popular idea, was suggested to him by the fall of an apple; Galileo, according to the same belief, got his idea of the pendulum from watching a swaying chandelier in a cathedral; and Madame Galvani, an invalid for whom frog soup had been prescribed, noticed the dead animals twitching, called her husband's attention to it, and so he made his great electrical discovery.



The actual facts are that what Newton really discovered was that the same force which causes things to fall to earth retains the moon in its orbit—and it was his years of mathematical study that made it possible for him to connect the two phenomena. Galileo had been studying falling bodies for years and had proved the absolute regularity of their movements long before he suggested the pendulum as a time measurer; and as for the Galvani story, it is a proven fact that he had been using frogs' legs for electroscopes for eleven years before his wife's health failed. It likewise is known that the pretty story of the invalid and her observations was fabricated by Alibert, an Italian writer.

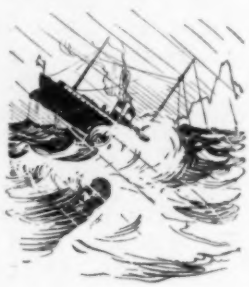


The idea that whetstones are oiled to reduce the friction of the metal being sharpened on them is another of the well-known, but untrue, facts. The oil actually increases the friction. The reason is that the tiny parts of metal rubbed off the blade being sharpened would be rubbed into an unoiled stone and burnished smooth, lessening its cutting powers, so oil is used to keep the metal parts in suspension and saves the stone.

That lightning never strikes twice in the same place has been repeated so often that many people believe it implicitly. Yet the Washington monument was struck several times before it was equipped with lightning rods; the steeple of St. Mark's in Venice was struck frequently before it was supplied with conductors; and there is hardly a city in America but what has a tall smokestack or two that has been hit more than once.

Another belief which is general, particularly among people handling explosives, is that the force of dynamite is always exerted downward. Soon after the invention of the explosive, it was found that a stick laid on the ground would tear a deep hole beneath it, or if laid on a slab of stone would shatter the stone, instead of expending its force upward where, apparently, there was no resistance. In neither case, however, was there anything above the stick on which it could have wrought damage! If the stone had been raised on pillars and the stick of dynamite placed under it, the slab would have been shattered as easily. The explanation for the apparently downward action of dynamite is simple. Its destructive power is due to the tremendously fast expansion of the gases generated by the explosion. On a stone slab, three feet square, there rests a column of air weighing nearly nine tons. If moved slowly this air does not offer much resistance, but when the dynamite is exploded and the gases try to move nine tons of air at their own speed the resistance is nearly as great as that of solid matter, so the force is expended downward, as the stone slab breaks more easily than the air will move.

Every few months the newspapers announce that some obscure mechanic has rediscovered the "lost art" of hardening copper and has been offered a million or two million dollars for his "discovery." As a matter of fact, that ancient art of hardening copper is not lost



and there never has been a time when we could not produce copper tools as hard as any the ancient Egyptians made. But copper is more expensive than iron and a copper tool is not nearly so efficient as a steel one, so nobody cares to harden it.

Practically everybody believes that he can see steam—yet this is just another of those well-known facts that aren't facts at all. What you see coming out of the engine exhaust as a white cloud is simply minute particles of water. If they were in the state of steam you couldn't see them at all.

Another commonly accepted fallacy is that large lenses are more powerful than small ones. The power of a lens, meaning the extent to which it magnifies an object, is directly dependent upon the curvature of the surfaces, so it is easy to see that the smaller the lens the greater the curvature, and hence the greater the magnification.

Natural history, as represented by the common beliefs and superstitions, is full of similar errors. For example, there is the belief that when a turtle bites you, it won't let go until it hears thunder, and that small houseflies are the young of large flies. As for the latter, it is not generally known that flies, bees, wasps, butterflies, moths, etc., are as large at the time they emerge from the cocoon or cell as they ever are afterward.

An untruth that bobs up persistently is the theory that a ship sunk in the deeper parts of the ocean never reaches the bottom, but continues to float around in the depths forever. The proof of the mistake lies in the fact that it is impossible to compress water beyond a minute quantity, hence four miles down it has very little greater specific gravity than above. The ship still weighs more than the water it displaces, and so goes to the bottom.

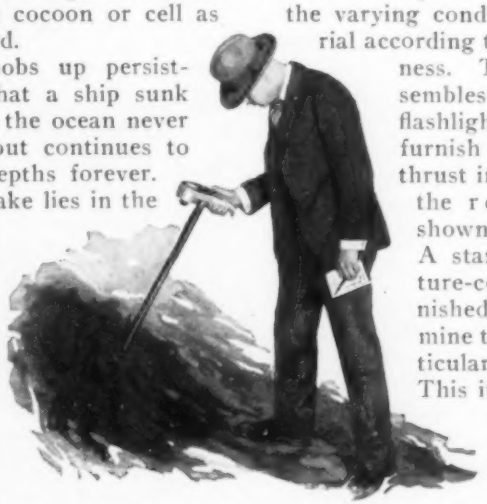
ELECTRIC LIGHT-BATH CABINET TREATS ENTIRE BODY

Rays are projected upon the body from below as well as from above in a combination electric cabinet for administering light treatments. Lamps are arranged in the table part of the outfit and in the canopy which covers the patient. The heat and light can be accurately regulated.

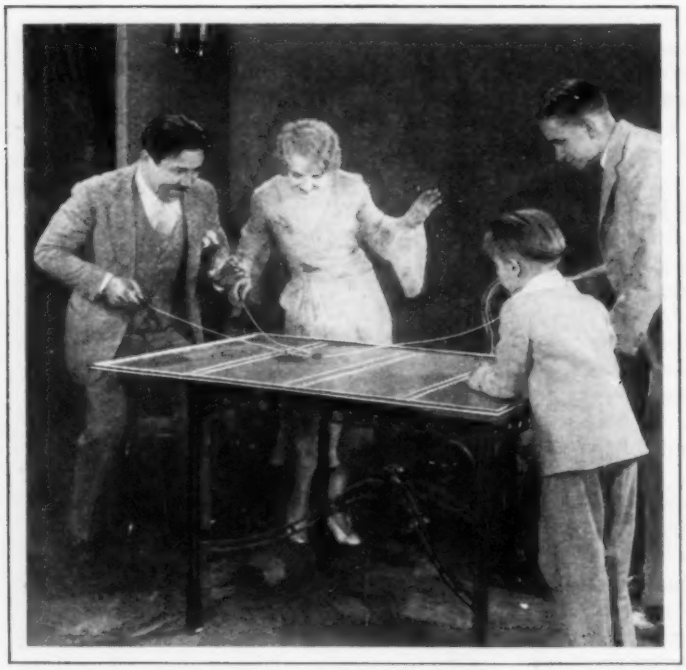
Taking Treatment in "Sunlight" Cabinet Which Projects Rays from Below as Well as from the Top

METER TELLS SAND MOISTURE AIDING FOUNDRY WORK

To eliminate guesswork in estimating the amount of moisture in sand for foundry purposes, an electrical meter has been devised. It operates on the principle of the varying conductivity of the material according to its degree of moistness. The gauge, which resembles a cane, and contains flashlight dry-battery cells to furnish the current, is simply thrust into a pile of sand and the reading is instantly shown on a dial at the top. A standard chart of moisture-content figures is furnished from which to determine the wetness of the particular sample being tested. This instrument is intended to promote greater accuracy, saves the time and expense of laboratory tests and is simple to use.



Moisture Meter in Use; End of Stick Is Stuck in Sand Pile and Reading Taken from Handle



Monte Banks and Pauline Garon Pushing the Disk against a Single Rival; the Game Is a Steady Battle of Skill

TENNIS AND FOOTBALL THRILLS IN LATEST TABLE GAME

Skill and determination are required in playing a table game that has some of the principles of football and tennis. Two or more persons can play at one time. A wooden disk, started at a line in the middle of the folding field, is to be shot with flexible wire pushers into a goal at the opposite side of the board. All players tackle the disk at once so that the contest is a steady battle until a score is made. A foul line is drawn around the field and pushing the disk out of bounds penalizes the offending player or side one point.

MOUNTAIN LIONS ARE COWARDS HUNTERS DECLARE

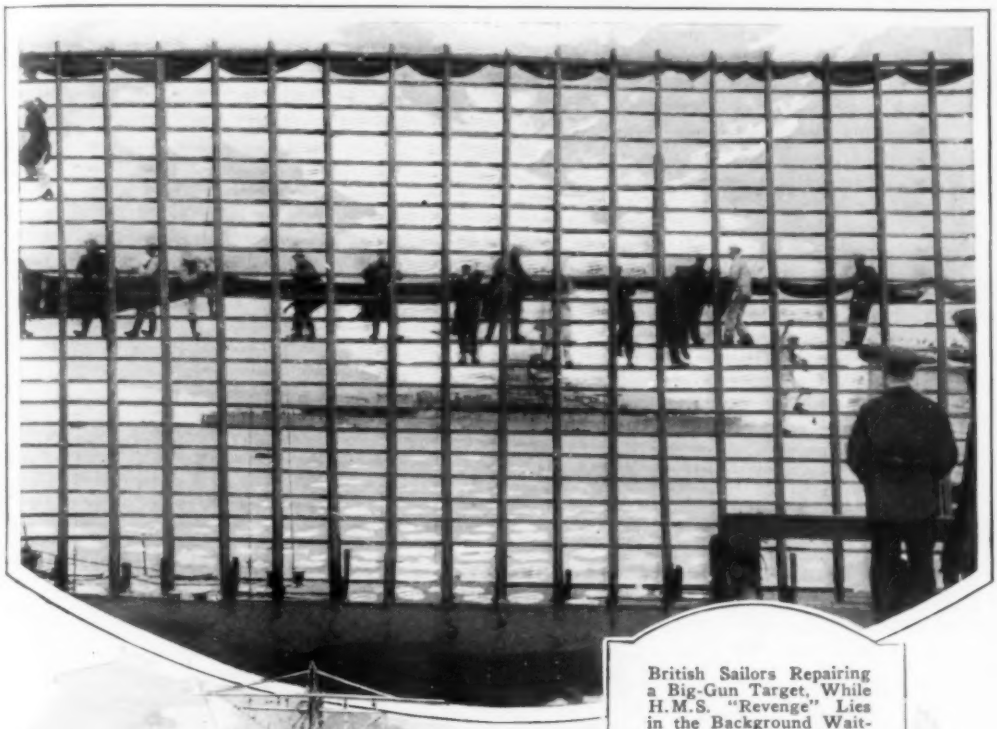
Mountain lions rarely show fight unless wounded; even a mother will desert her young when dogs draw near, and, though the lions can run with express-train speed for 100 yards or so, they are soon winded and forced to take to a tree. According to M. E. Musgrave, of the United States biological survey, the mountain lion is probably the least courageous of the larger wild animals. Its cowardice seems hard to reconcile with the facts that it usually weighs 150 pounds or more when grown and is so strong that it can kill horses weighing 800 or 900 pounds and drag them thirty feet into the bushes. It has been known to carry away deer and big calves without any evidence of dragging. The animals are phenomenal jumpers. A leap of twelve or fifteen feet into a tree from the ground is not uncommon, and they have been known to jump down fifty or sixty feet from a branch without injury. Like the cat, they have the ability to land on their feet. Mr. Musgrave reports that he has climbed out on a limb and taken pictures of a lion while sitting within six feet of it. The animal hissed and growled, but showed no other signs of fight. After a short chase, the lion soon becomes nearly exhausted and sticks to its tree even though punched with a stick.

OLD CHAIRS QUICKLY MENDED WITH SIMPLE BRACE SET

Without extensive overhauling, old chairs that have become loose can be strengthened for further service by attaching a patented set of clamps and wire braces. The device is fastened to the chair bottom and affords a support for each leg. The clamp may be tightened by means of a threaded bar located in the center.

¶All railroads in Europe with the exception of those in England, are to adopt twenty-four-hour time tables.

GREAT BRITAIN'S WARSHIPS SHOW THEIR STRENGTH



British Sailors Repairing a Big-Gun Target, While H.M.S. "Revenge" Lies in the Background Waiting to Resume Firing; Below Is Part of the English Atlantic Fleet Plowing through the Seas in Close Formation on the Way to the Annual Battle Maneuvers

FISHING IN THE DESERT FOR SNAKES AND LIZARDS

Mr. Rowe at His "Dry Land Fishing," and Two Specimens; the Noose in the Line Easily Slips over Reptile's Head

If you motor across one of the deserts of the southwest and see a man in the costume of a trout fisherman, carrying a creel and "fishing" in the sage brush and cactus with a rod and reel, his name is Willis A. Rowe, whose specialty in natural history research is snakes and lizards. He catches his live specimens for study with a trout rod and reel, and carries them to his home at San Fernando, Calif., in an ordinary creel. Mr. Rowe, who has been studying snakes for twenty years, has tried "snake sticks" and all the other known methods of catching reptiles alive. The trout-fishing outfit, however, which he devised for his own use, is said to be much safer and more efficient. It is safer because it allows him to work at a distance and is more efficient because a snake or lizard, once ensnared by the trout line, has never been known to get away. No hooks are used for catching snakes. The scientist merely makes a slip noose on the end of the line, which is then allowed to dangle from the casting rod. When he finds a reptile that he desires for study, the creature is easily approached at a safe distance. The slip noose is then dropped over the head of the snake or lizard, and the reptile is lifted off the ground. It is then easy to gain a handhold upon the reptile's neck just back of the head to avoid any possibility of being bitten.

FIRST COPPER WAS SMELTED WITH PETROLEUM?

That the most ancient copper used by man may have been smelted by heat from petroleum, one of the most modern of

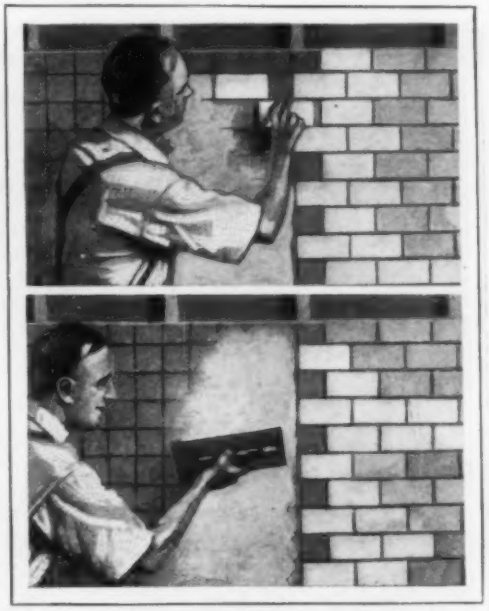
fuels, is the theory advanced by an eastern scientist. The process, if followed, was probably the result of an accident, nature, rather than man, arranging the primitive procedure. The belief is based upon the similarity of the region along the Iora and Kura rivers in the Caucasus, the home of the early Egyptians, to the description of the Egyptian paradise outlined in the "Book of the Dead." In this area, petroleum, seeping out, has formed small lakes and pools in close proximity to copper ore. The theory is that the oil became ignited accidentally so that when the copper was discovered later, it was in metallic form. The most widely held supposition is that primitive man became a metallurgist when the family campfire had been made where copper ore happened to be present.

BIG-WHEEL VACUUM CLEANER ELIMINATES LIFTING

Easily taken up or down stairs, a large vacuum cleaner with a blower attachment can be moved around by one person without lifting. It weighs 100 pounds and the blower is said to be effective in removing dust from difficult places, as from electric motors and other apparatus and behind radiators.

To Make Housework Still Easier; Big Vacuum Cleaner on Rubber-Tired Wheels Saves Lifting

It is built for use in office and apartment buildings and homes.



Building Wall of the Steel Tile; It Is Laid against a Special Cement and Insulating Material

STEEL TILE FOR BATHROOMS CUTS COST OF WALLS

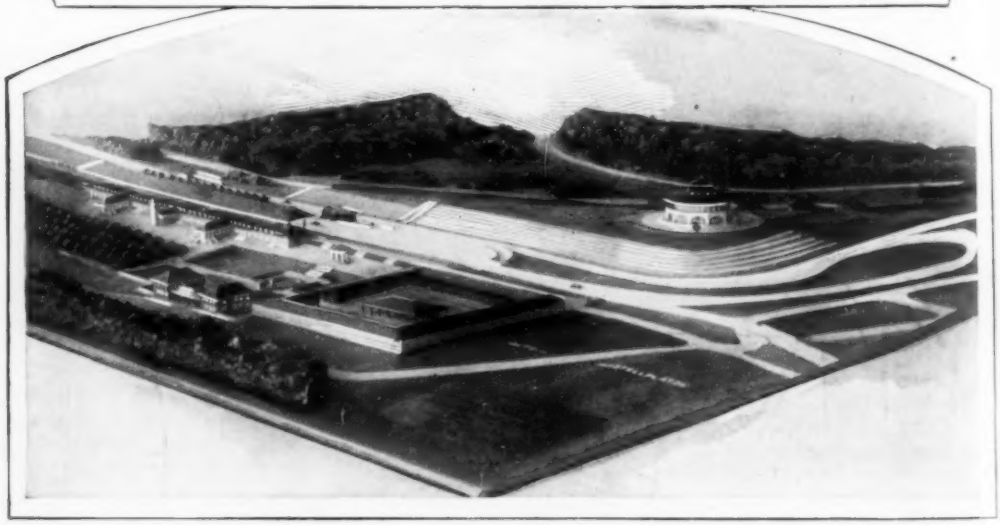
Tile of the same material as is used in tubs is now furnished for the bathroom walls. It consists of porcelain enamel fused on steel. The pieces form a smooth, durable surface which is easily cleaned and resists corrosion. An insulated base and special cement, against which the tile is laid, help keep out heat and cold.

BOARD FOR AVIATION PATENTS TO AID INVENTORS

A board to consider aviation patents and designs has been organized by act of congress and is now in operation at Washington. It is composed of the assistant secretaries of the army and navy for aviation, and the assistant secretary of commerce. The purpose of the board is to give thorough scientific and practical consideration to all designs, inventions and improvements relating to aircraft that may be submitted by any individual or corporation, and it is authorized to pay not to exceed $75,000 for any design, improvement or invention it may consider of value to the government. Payments so made, vest the ownership of such inventions in the government.

UNIQUE AUTO RACE COURSE HAS FIVE TRACKS IN ONE

TWISTING and Turning through the Rolling Hills of the Eifel District in Germany, the Nuerburg Ring Motor-Race Course Will Be Practically Five Tracks in One, as It Will Contain Four Smaller Courses within the Largest. The Main Road Will Be Nearly Twenty Miles Long, and Extend over a Section of Territory Six Miles Wide; Stands to Accommodate More than 10,000 Persons Are Being Constructed at the Starting and Finishing Points, Where Garages, Repair Shops and Other Service Facilities Will Be Provided. Above Is Shown a Model Diagram of the Entire Course, the Main Track Being Outlined by the Heavy White Line and the Smaller Rings in Lighter Tracing; Practically the Only Straight Section of the Entire Circuit Is Back of the Lofty Observation Post in the Upper Center. To the Right of the Peak May Be Seen the Starting Point. Below Is a Model of the Grandstand Pavilion, Garages and Parking Spaces at the Start. Races Will Afford Opportunities for Testing Brakes as Well as Speed



PHONE BUOY FOR SUBMARINES TO AID IN RESCUES

As a means of locating and communicating with submarines that are unable to rise to the surface, a special buoy has been devised and has been considered by the British admiralty. It is to be carried alongside the conning tower, and if the craft is unable to emerge, the buoy, filled with compressed air, on being released, rises to the surface. It is attached to the submarine with a cable and contains a telephone with connection to the crew below so that rescuers could communicate with the men. The buoy is also equipped with rockets, a lighting apparatus and signal bell in order to attract the attention of passing ships.

REPEATER RAZOR SAVES TIME IN CHANGING BLADES

Twenty blades are held in the handle of a magazine safety razor now on the market, and a new one is adjusted simply by tilting the top or head of the razor, pulling out a plunger and pushing it back. The old steel falls out and the fresh one drops into place. The blade can be adjusted by moving the razor head to the best angle for shaving. The used pieces are put back into the "magazine" and when all twenty have been employed, they are thrown away in a package. New blades are furnished in a clip which is easily inserted. The entire outfit, when closed, is little larger than a fountain pen.

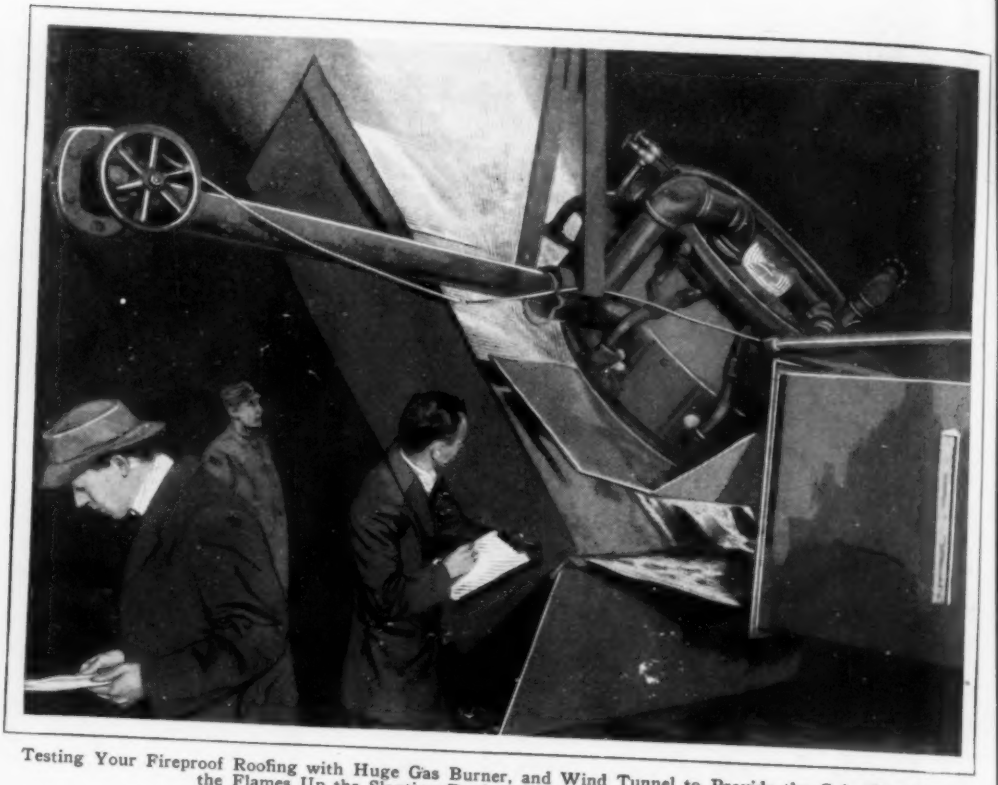
Photo Diagram of the Magazine Razor, Showing How the Blades Are Renewed

Testing the Parachute with Dummy; the Pockets on Sides Serve as Supplementary Supports

NEW PARACHUTE WITH POCKETS TO EASE DESCENTS

With a row of air pockets about the lower edge, a balloon-shaped parachute devised by an Italian inventor, is intended to make descents more slow and hence ease the shock of landing. The pockets act as small parachutes in themselves and the depth of the main bag as compared with the shallow interior of the usual type of support is a prominent feature. The pockets are also arranged to help open the parachute when the wearer releases it.

¶The color sense is not developed in children until they reach the age of about two years.



Testing Your Fireproof Roofing with Huge Gas Burner, and Wind Tunnel to Provide the Gale That Blows the Flames Up the Slanting Roof and under the Overlapping Edges

Unseen Firemen Who Guard Your Life

Potential Dangers Located Before They Can Arise by Scientists Who Battle Blazes in War to Protect Your Home and Business

A SHEET of flame from an immense gas burner is being driven against a section of fire-resisting roof material by an air blower.

Firemen, without rubber boots, hats and coats, who never rode a swaying motor truck are standing by. Instead of hose and water they hold loose-leaf clips filled with charts. One watches a clock and another the electrical controls of delicate thermometers which are measuring the heat on top and underneath the section of roof.

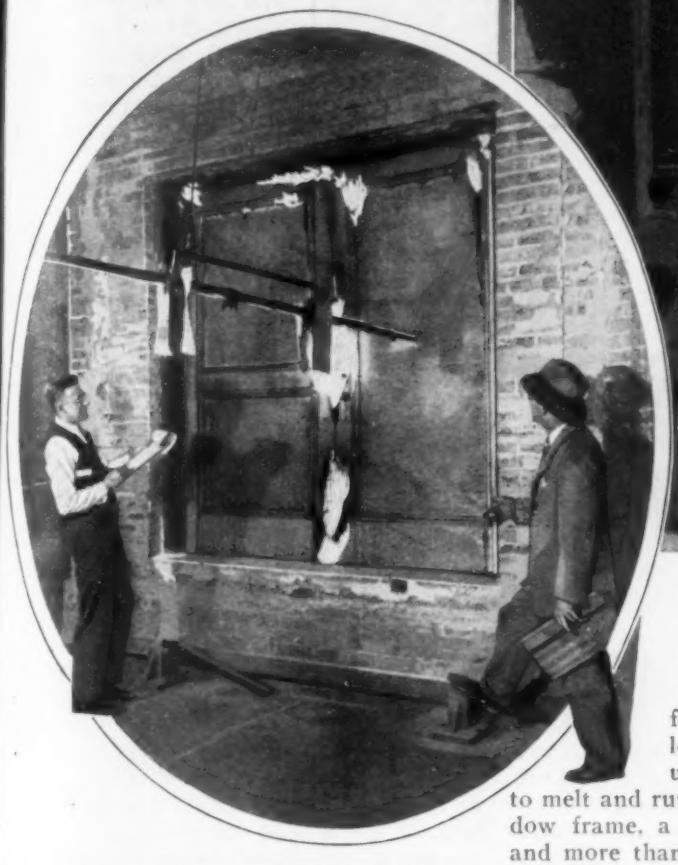
They are fighting the fire that may menace your home next year or ten years from now, fighting before it ever happens, and doing it silently, efficiently and out of sight, with never a red-painted hose wagon to attract the public's eye.

The scene is in the laboratories of the fire underwriters, a huge plant where scores of trained scientists spend their lives trying to wreck and destroy the cherished inventions of other men, in order that the unsafe and the dangerous may be eliminated and only the things that make life safe get out to you.

The flames shooting up the model section of roofing will be kept at a fixed temperature for a certain period, and then the damage, or lack of damage, will be carefully measured, and the manufacturer will be told either that his product is safe or that it is unsafe. If it is approved as standard, every insurance agent will be prepared to give you a reduction in your premium rate if you use that roofing.

Fire testing is only a small part—though one of the most important—of the work of the laboratories. They reach out into

very branch of fire, safety and burglary protection covered by insurance. Every piece of fire hose manufactured in the United States must pass one of their inspectors, on duty in the factory; out of every dozen or so lengths a small piece is clipped from one and sent in for testing at the laboratory, and from every few hundred an entire length is taken.

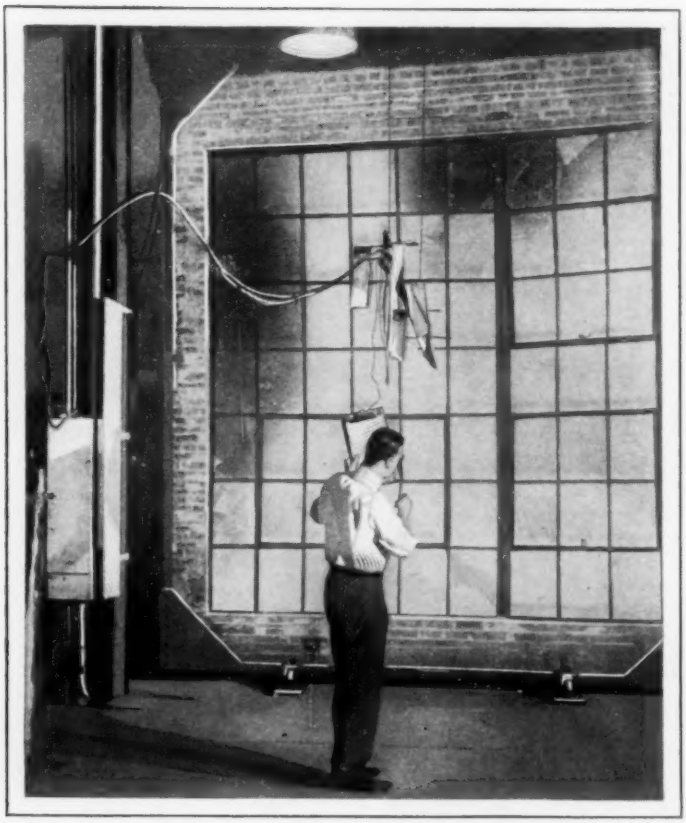


Expanding on the Side Next to the Fire First, a Huge Steel and Wire-Glass Window Slowly Bends In to the Flame; Left, Metal-Covered Fire Doors Flicker with Wood-Gas Flames as the Interior Carbonizes

In the laboratory itself fires are raging nearly every weekday of the year, burning up roofing and fire doors and windows, and even huge steel safes and office files. Several hundred thousand dollars has been invested in vast gas furnaces in which material can be submitted to tests more severe than any encountered in an ordinary fire.

One of these is equipped with enormous steel front frames, suspended from a track above, in which solid brick walls, twenty feet square and with doors or windows built in place, can be assembled, rolled in front of the gas burners, locked in place, and burned until the very bricks begin to melt and run. Picture a big steel window frame, a dozen or more feet wide and more than that in height, built into an eight-inch brick wall, and with frames filled with wired glass. The fires are lit, and with thermometers checking the temperature, the heat is gradually brought up to an enormous height and held there until an hour has passed. Long before that time, the glass has cracked in a million places, but the wire binding holds it in place. As the minutes pass, some of the glass begins to run, and little holes appear, with an occasional tongue of flame licking through.

The steel frame itself expands under the tremendous heat and, being hottest on the side next the blaze, begins to bend in toward the flames. The putty next begins to give way, and whole panes of glass will



Heat, So Intense It Will Melt the Wired Glass, Is Raging behind This Big Fire Window during the Test

slowly sway out from the top and bend downward. Taut wires are stretched across the furnace front and the distance from them to the face of the glass has been carefully measured at a dozen places before the fires were started. Now the attendants dash into the intense heat at intervals, raise a long steel yardstick and measure the distances again to determine the amount by which the steel frame has been warped.

Suspended in front of the furnace is a long pipe carrying a series of thermometers, to record the temperature at varying distances in front of the window, a check that shows how far inflammable material should be kept away to prevent communication of a fire from an adjoining building. As the last five-minute period of the hour begins, the timer starts calling off the minutes, and on the final one the seconds. Men at the furnace release the chocks holding the framework and, at the call of time, shut off the gas and roll the red-hot brick wall and window to one side. Instantly a two-inch fire hose is played over it to see how badly the window will break under the impact, determining the quantity of water that might pass through to damage stock inside.

The testing of a big steel safe is even more thrilling. The insurance covers valuable papers and records, and losses through the interruption of business, so the underwriters are interested in seeing that they are kept safe. Because of its weight, a safe not only is subjected to damage by fire, but also to that suffered when floors give way and it drops into the basement, possibly from the heights of a tall building. So the manufacturer sends a brand-new safe. It is loaded with old record books, newspapers and loose sheets covered with writing, and put in a big furnace, after holes have been drilled to carry the leads of electrical thermometers placed in the interior and a tube for air samples. The furnace is sealed and the fire started, to burn for hours.

The thermometers inside the safe record the temperature, and show whether it has reached the point where the papers will begin to char, while the air tube enables the observers to take samples from inside the safe and test them for dangerous gases. The latter is important, as the gas pressure may blow the strong box open.

After hours of heating, the red-hot safe is hauled out of the furnace, lifted by a crane and swung thirty feet up a huge brick stack, then dropped to a ten-foot thick concrete floor below. Back into the furnace it goes for more hours of heating, then it is opened and the condition of the contents noted.

Banks of Foot-Square Pans Are Used to Catch and Measure the Water from an Automatic Sprinkler Head

Cauldrons of Blazing Gasoline Provide a Chance to Try Out Foam Extinguishers; Below, Firemen Are Watching a Test of Hose and Couplings; Every Piece of Fire Hose Used in This Country Is Carefully Tested at the Factory While Being Made

Steamer "C. A. Larsen," Showing the Blunt Prow Which Opens to Permit Dragging Whales Aboard

SHIP HAS BIG DOOR IN PROW FOR LOADING WHALES

So that whales can be dragged into the hold, the steamship "C. A. Larsen," flying the Norwegian flag, has a water-tight door in its blunt prow just above the water line. This eliminates the necessity of towing the catch back to shore before working out the oil and preparing the other marketable substances.

WHY DO WE LAUGH?

Many explanations have been given as to the cause of laughter. Herbert Spencer believed that laughing was an overflow of excessive nervous energy. Henri Bergson, the French philosopher, concluded that laughter was evolved by the race as a means of discipline. Prof. William McDougal, of Harvard university, believes that nature has developed laughter in order to protect us against the excessive working of the instinct of sympathy, first because, when we laugh, the rate of breathing is increased and the circulation of the blood stimulated, and, secondly, the trend of thought is broken up so that the mind is carried away from a situation that otherwise might tend to cause depression.

REPAIR MEN TURN ACROBATS FIXING TOWER CLOCK

Workmen called to repair the tallest tower clock in Berlin demonstrated their agility as well as their technical knowl-

Looking Down on the Workmen during Repairing of the Tower Clock; the Moving Hands Increased the Hazards of the Task

edge during the job. Confined to a small platform erected just beneath the middle of the dial, they were limited to close quarters and the moving hands, tending to cause a grip on them to slip, presented an additional hazard.

WHERE ONE DIVE INTO THE SEA MAY BRING A FORTUNE

Divers in the south seas flirt with fortune daily, for there is always a chance that the shell they pick up may contain a valuable pearl. A greenish one of twenty-six carats was sold in New York for $16,000 and although the finder probably did not get more than $500, the sum was sufficient to make him independent for life. The divers gather shells for making buttons. This brings from $80 to $100 a ton. A rule is that the finder keeps the pearls. As they open the shells, the divers' gambling instinct is keenly alive, for their fingers may dislodge a pearl valued at hundreds of dollars. In the shallower waters, clusters of mussels are found which occasionally yield yellow pearls, not so valuable as the pink and white ones but prized for their oddity. No diving apparatus is used and the natives are able to remain submerged as long as two and a quarter minutes. They place the shells in a weighted net at the bottom, which is then drawn up with a cord.

CHINA CAT AND BIRD ON WALL UNIQUE HOUSE DECORATION

China figures of a cat and a bird on the front wall of a house in England attract attention from passers-by. The cat is posed as though chasing the bird and both are realistically modeled. They are held by hidden brackets.

China Figures of Cat and Bird Attached to Front Wall of House

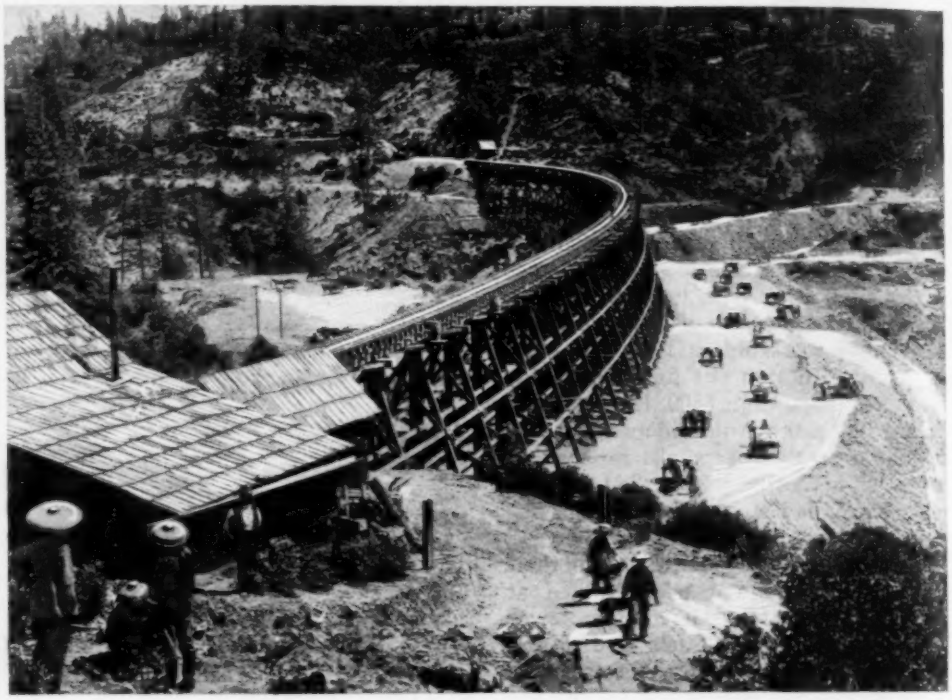
Applying the Strip of New Rubber after Scraping Off Worn Tire Surface; Vulcanizing Follows

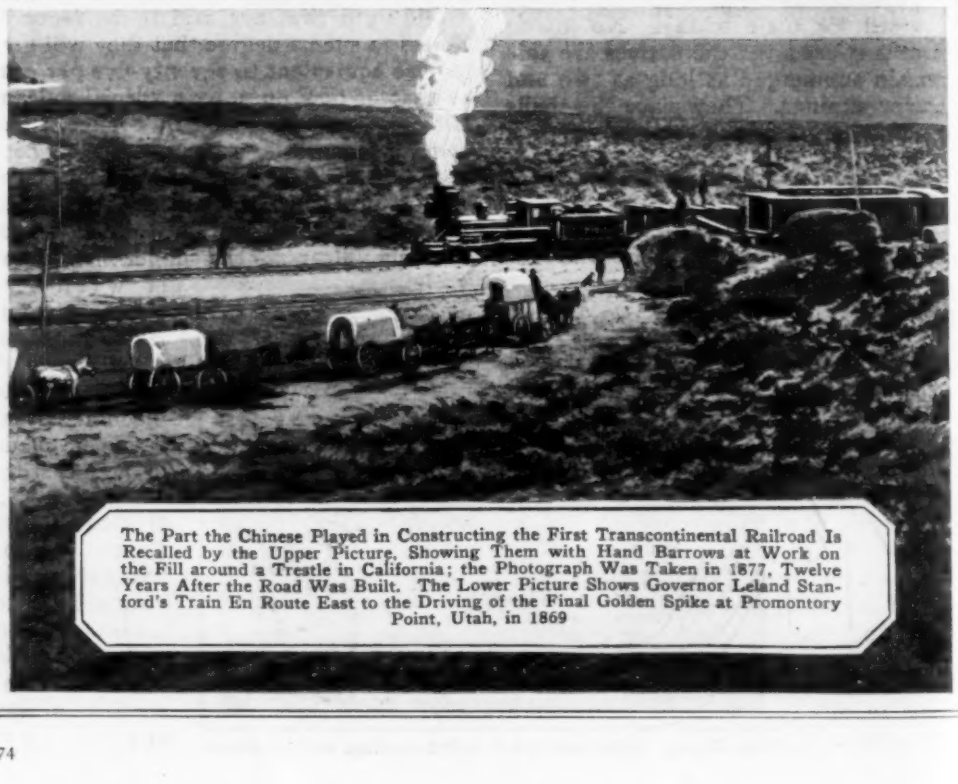
NEW PROCESS OF VULCANIZING TO CUT TIRE BILLS

Old auto tires are said to be reconditioned to such a degree that they will give service equivalent to seventy-five per cent of that of new ones, by a special vulcanizing process developed in France. The worn surface is first removed, then covered with a secret gumlike material. Over this is placed a new rubber strip, then the tire is treated in the machine, which not only vulcanizes the rubber but stamps it with impressions similar to those on new tires. A feature of the machine is that it can be made to fit any tire.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine.

HISTORIC VIEWS SHOW CHANGE FROM TRAIL TO RAIL





The Part the Chinese Played in Constructing the First Transcontinental Railroad Is Recalled by the Upper Picture, Showing Them with Hand Barrows at Work on the Fill around a Trestle in California; the Photograph Was Taken in 1877, Twelve Years After the Road Was Built. The Lower Picture Shows Governor Leland Stanford's Train En Route East to the Driving of the Final Golden Spike at Promontory Point, Utah, in 1869

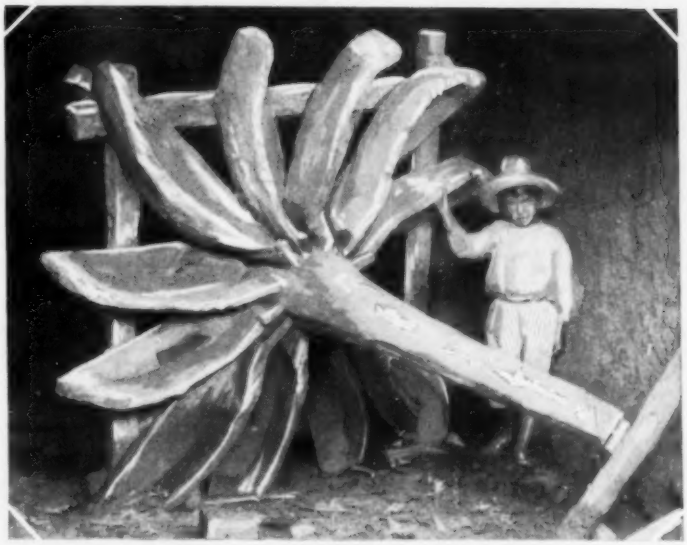
GOLDPLATING DONE WITHOUT ACID IN VACUUM

Textiles, laces and other materials can be goldplated successfully by a new process developed in Germany, according to reports—a method which requires no acids and has other economical features. The metal is deposited upon the object by means of electricity aided by a vacuum container and is dry and in molecular form. No polishing is necessary after the plating, as polished articles do not lose their luster, it is said. On sheet and wire, an even coating is applied but on irregular articles the parts closest to the electrodes receive a heavier layer. This, however, is considered an advantage as they are the areas subjected to the greatest wear. The action of the electric current within the vacuum tends to drive the tiny particles of gold along so fast that they collide with enormous force against anything standing in their way and become attached to it. The process also is said to give a more durable plating.

HIGH-LIFT TRUCK BODY DUMPS AT SIDE, TOP OR BOTTOM

Loads can be dumped easily over obstacles from a lift truck body that is raised on four steel screws to the height of eight and one-half feet. It is so designed that it can be emptied from the top, from either side or from the bottom. The special feature by which it will operate without binding even when the truck is on an incline, is of particular value, the manufacturers assert.

Body Elevated for High Dumping from End; It Also Empties from Sides or Bottom



Turbine Water Wheel, Cut from Wood Nearly Four Centuries Ago for Mill in Mexico; It Still Operates

TURBINE WATER WHEEL CARVED CENTURIES AGO

Turbines are generally associated with modern power plants, but from Mexico comes proof that this form of wheel was known to Spanish engineers more than 380 years ago. The wheel was carved by hand from hard wood and belongs to a mill in the state of Ciapas. Although built in 1540, the mill still runs and the original wheel is in service. The turbine was adapted so that the fullest efficiency might be realized from the small water power available on the site. A reservoir was constructed to store up water at night so that additional supplies could be used the next day. The turbine was placed deep under the level of the ground to increase the fall. Two wheels of this type were made for the mill. They make from seventy to 100 revolutions per minute. The present owner of the installation intends to use it to generate electricity for lighting and power purposes.

Turning Ships Into Autos

Giant Cutter Used to Slice Ships into Sections Ready to Go to the Furnace to Be Melted for Automobile Parts

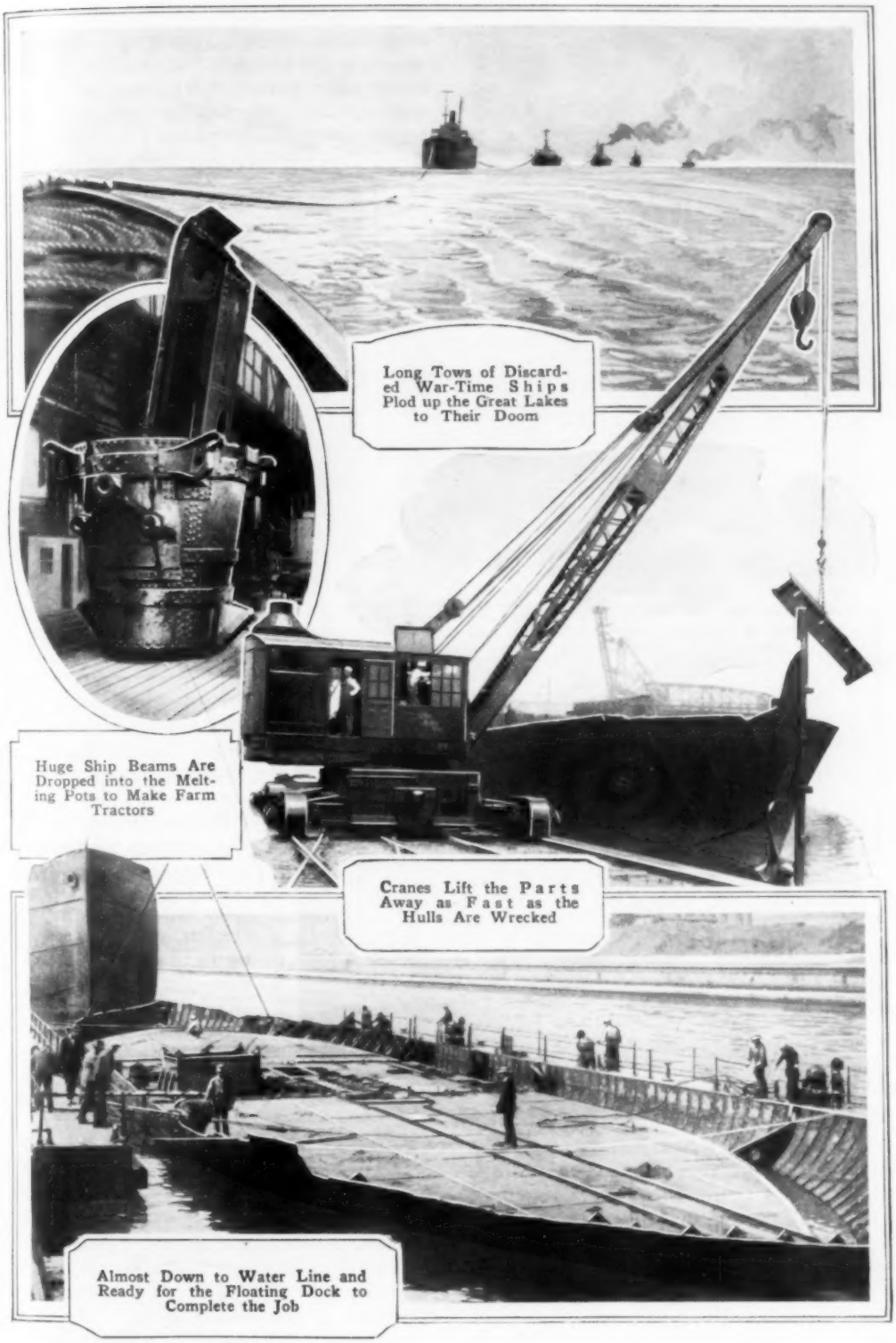
WITH a special plant built to cut up 199 war-time steel ships and convert the scrap into automobiles, Henry Ford is demonstrating new ideas in salvage work. Like the packing plants that "save everything but the squeal," the ship workers are using everything but the coating of barnacles and rust the vessels brought up from the sea.

The salvage wharf provides docking space for twelve ships at a time, and the first ship in the line disappears every second day, while a new one moves in at the other end. A different operation is carried out in each berth, the remains moving on to the next place for the following step, until in the last stage, having been wrecked to the water line, a floating drydock slips under what is left and raises it to the surface for the final cutting.

Alongside the dock, one railway line is equipped with a series of wrecking cranes, and beyond that, three other tracks provide for trains to haul the salvage away. Of these, one takes steel scrap to the furnaces to be melted up at the rate of 300 tons a day for auto axles and tractor parts. A second hauls the woodwork to the wood plant, and a third carries away the salvaged parts, boilers, refrigerating plants, electrical installations, searchlights, life preservers, and myriads of other fittings.

Some of the searchlights are shipped to Ford airplane fields to be used as guides for night planes. Two of the boilers, generating 1,500 horsepower, have been set up at the company's locomotive works to furnish additional power. Other boilers have been shipped to branches in this country, Paris and other foreign posts. Of the electric light and refrigeration plants a number have been installed at company mines and timber camps. The life preservers are emptied of their cork and this is used for refrigeration packing. Deck cabins, lifted off bodily, have been turned into tool houses and small offices and distributed among the various plants.

The 199 ships cost the government $100,000,000 to build, and were sold as scrap for $1,697,470. Despite the low price, however, the scrap sent to the furnaces is costing, including labor and other charges, about $13, whereas similar scrap can be bought in the open market for around $11 a ton. The company will break even, or even make a profit, on the value of the salvaged parts for which a use can be found. Under the terms of the sale, none of the material can be sold.



Long Tows of Discarded War-Time Ships Plod up the Great Lakes to Their Doom

Huge Ship Beams Are Dropped into the Melting Pots to Make Farm Tractors

Cranes Lift the Parts Away as Fast as the Hulls Are Wrecked

Almost Down to Water Line and Ready for the Floating Dock to Complete the Job

MAN DEFEATS LIVE ALLIGATOR IN UNDERWATER BATTLE

George Link in Wrestling Bout with Live Alligator; the Photos Were Taken in Moving Picture Studio

Wrestling with live alligators under water is the strenuous pastime of a western man who has devoted several years to the study and raising of the creatures. To demonstrate his skill and show that he hadn't trained one especially for exhibition purposes, he allowed visitors to pick out any one of the alligators for him to fight. The bout was staged in a glass tank at a motion-picture studio, while photographers recorded the results. For eighteen minutes, the struggle lasted with but two short rest intervals. The trainer's bathing suit was torn, but he suffered no injuries. He manages to hold their jaws together while wrestling with them and can walk barefooted among them without mishap.

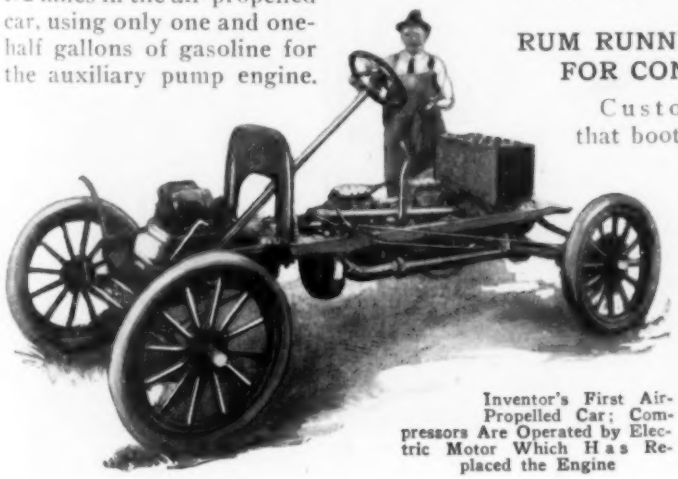
CHICAGO POWER LIGHTS LAMPS IN BOSTON

Switches were closed, electric current from a Chicago generating station sped along interlaced wires and lights in Boston, 1,000 miles away, flashed in response. Another engineering dream had been realized. The demonstration was proof of the power web that has been woven between the east and the mid-west, a vast connecting scheme for the exchange of electric current between stations. It promises, engineers say, economy, greater efficiency and lower rates. It will reduce the need for expensive reserves of power at individual stations, the distribution of peak loads at different hours

in different regions can be done with lower equipment cost, for one station can draw from another instead of buying more generating machinery, and it will reduce the loss of letting equipment lie idle part of the time. The hook-up does not mean that it is yet practical to light Boston from Chicago. Some 500,000 volts would be required for the economical operation of so long a line and that is too much to handle, at present, engineers declare. On the Pacific coast, there is a similar system of interconnecting lines, a 1,800-mile hook-up, with 300 miles the longest transmission, for which 220,000 volts are required. The next step planned is to bridge the Rockies, linking the coasts together.

AUTO RUN BY COMPRESSED AIR CUTS FUEL EXPENSE

Possibilities of compressed air as power for the automobile have been tested by a western inventor in a special car he has devised. It is said to run an average of thirteen miles on one filling of air at 400 pounds' pressure and, at 150-pound pressure, develops thirty horsepower. Fuel expense is reduced to almost nothing, as the operator can refill the tanks at a service station and the pumps on the car are arranged in such a way that the momentum in going downhill helps keep up the pressure in them. On one auto, a motorcycle engine is used to drive the compressor and, on another, an electric motor supplied with current from a storage battery. The inventor recently made a journey of 192 miles in the air-propelled car, using only one and one-half gallons of gasoline for the auxiliary pump engine.



Inventor's First Air-Propelled Car; Compressors Are Operated by Electric Motor Which Has Replaced the Engine

Kerosene Fire in Grate; the Box Is Filled with Absorbent Wool and Is Easily Removed

PORTABLE KEROSENE FIRE BOX HELPS SAVE COAL

To take the chill off the room, an aluminum box with a handled lid is filled with asbestos wool soaked in kerosene and ignited after placing it in an open grate. One filling is said to afford a hot fire for an hour. If less is desired, the blaze may be extinguished at any time simply by putting on the lid.

RUM RUNNERS USE SUBMARINE FOR CONTRABAND CARGO

Custom authorities discovered that bootleggers had adapted up-to-date naval equipment when they captured an odd-looking craft in Lake Champlain, loaded with 4,800 bottles of ale. It was a submarine that could be towed behind a launch and submerged. Three such submarines were found following a successful escape of the first one, which was being towed.

Eye Exerciser in Use; Levers in Front Permit Movements to Relax Muscles

POCKET EXERCISER FOR EYES TO HELP VISION

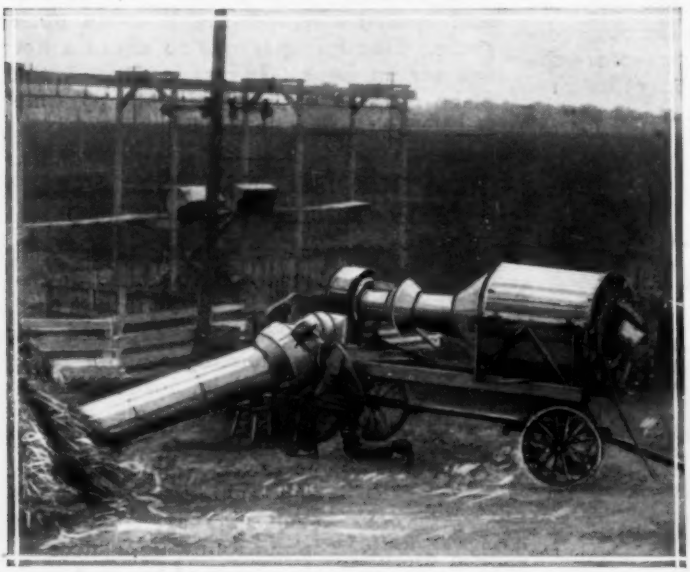
To relieve eye strain and rest the muscles of the optic organs, an exercising device that can be carried in the pocket or handbag, is intended to be of aid to persons of nearly every age and occupation. It consists essentially of two cup-shaped sockets, one for each eye. By means of small levers at the bottom of the exerciser, these cups can be rotated inward or outward. This action, combined with gentle pressure, is calculated to give the tired muscles of the eyes necessary relaxation and stretching to help relieve the tension and remove poisons that accumulate with fatigue through overuse. The treatment is said to bring helpful results and it can be used while at motion-picture shows, during automobile trips or other activities that demand unusual effort from the eyes.

ODD PLANT FORETELLS QUAKES; ANOTHER ACTS AS COMPASS

Leaves of the compass plant found in various parts of the Mississippi valley, keep their faces toward the rising and setting sun so that they sometimes serve as guides to persons who have lost their way. In Cuba is a flowerless plant that is said to enable scientists to predict earthquakes and volcanic eruptions. It is highly sensitive to electric and magnetic influences and makes certain movements as a result, by which the trained observer can foretell great convulsions in nature.

HOT-AIR FAN FOR DRYING CROPS TO CUT FARM LOSSES

To make the farmer less dependent on the weather and reduce losses are objectives sought in a portable crop drier developed at Purdue university. It consists chiefly of a blower with a capacity of 7,000 cubic feet of air per minute drawn around and through an oil-fired unit and delivered to the stack, which is built over a conical frame, through a ditch eighteen inches square. For drying hay, a temperature of 165 degrees is used. For grain, the heat should not exceed 140 degrees. The burner unit consumes between five and six gallons of fuel per hour. The outfit has been used successfully with soy beans and alfalfa.



Curing Hay with Blasts of Hot Air from Motor-Driven Blower; the Air Current Is Heated by a Kerosene Burner

DECORATING CAKES IS TAUGHT IN UNIQUE SCHOOL

Students Putting Ornaments of Sugar and Egg Whites on Cakes

Instructor with a Few of the Cone-Shaped Tubes through Which Frosting Is Forced, to Form Different Effects and Designs

Applying the Coating to Cake Before the Figures Are Molded, and Close View of Student Making Fancy Flower Decorations; the Frosting Is Squeezed Out of the Cone Held in His Right Hand

Honor to a California Hero, the Tablet to "Snowshoe" Thompson Dedicated in Los Angeles

MONUMENT TO MAIL CARRIER RECALLS HEROIC DEEDS

With the dedication of a memorial tablet to John A. "Snowshoe" Thompson, in Los Angeles, accounts of his heroic services to the United States and the pioneer west are being retold. In 1856, when heavy snows had blocked the Sierras, Thompson volunteered to take the mail bags on his back between Placerville and Carson Valley, a distance of ninety miles. He made a crude pair of skis from oak. They were ten feet long and weighed twenty-five pounds. The mail sacks were heavy, from sixty-five to 100 pounds, and the secret of doping the skis with preparations, to make them run more smoothly, had not been learned then. The snow stuck to Thompson's runners, there were no houses between the towns, drifts, from thirty to fifty feet deep, had to be crossed and no trail had been blazed. For twenty winters, "Snowshoe" carried the mails and without remuneration from the government. He died at the age of forty-nine, known as the pioneer of the stage and the locomotive and as one of the bravest men of early California days.

TREATING WATER ON RAILWAYS SAVES MILLIONS YEARLY

Railroads of the country are saving approximately $11,000,000 a year in locomotive maintenance by treating the water used for steam to remove scale-forming solids, an expert declares. This figure is considered especially significant since only fifteen per cent of the water is treated. The process costs about four cents per 1,000 gallons and about 50,000,000,000 gallons receive the treatment in one year.

FOOT BRIDGE OVER AVENUE REDUCES TRAFFIC DELAY

Bridges of the type illustrated here have been proposed for heavily trafficked streets in Paris so that pedestrians may cross in safety and without halting automobiles. The arch slopes gradually so that the steps are easy to climb.

Bridge for Pedestrians over Busy Automobile Street Is Expected to Reduce Traffic Delays as Well as Help Save Lives; Absence of a Supporting Column Leaves Way Unobstructed

Italian Monoplane Which Took Virtually the Same Lines as the American Speed Ships, Eliminated the Upper Wing and Won the World's Championship for Seaplanes

The Battle of Wings for Air Honors

U. S. Strives to Retake Records Lost When Italy's Monoplanes Proved Single-Wing Superiority

WITH the last of America's great air records carried away to Italy by Maj. Mario de Bernardi, victor in the Schneider cup race, airplane designers already are at work on new craft to represent this country in the 1928 races in Italy. Before going home Maj. Bernardi set four new world's records, and took away the last of the leading air honors won by Americans in the years following the war. His marks include all of the high-speed records for seaplanes, while French flyers had previously lifted the land-plane speed title, as well as the altitude record.

The defeat of the American flyers, representing both the navy and marine corps, was largely due to the cycle in which airplane building moves. A record-breaking type is developed, and then raced year after year until somebody comes along with a faster ship. The Curtis planes lifted the Schneider cup from Italy in 1923, and proved so fast that nobody came over to race for it the following year. In 1925, both Italian and British ships were sent over, and badly beaten. The Italians went home and built better craft, which in many respects closely resembled the American ships but had vastly more powerful engines. Racing them in 1926 against the American ships of the year before, they won by many miles an hour.

American flyers, however, still have a chance to gain permanent possession of the Schneider trophy if they win the 1928 race. Under the terms of the gift from Jacques Schneider, the seaplane trophy was to become the property of the nation winning it three times in five years. Having won in both 1923 and 1925, another victory would give the United States the cup, even though the 1928 race falls outside the five-year period begun with our first victory in 1923. The reason is that the international aeronautical federation, which controls the race, decided before last year's event that, if Italy won, races thereafter would be held every other year instead of yearly, so that the cup terms will specify three victories out of five consecutive races, instead of three wins in five years. It is even possible that it may be decided, should the United States lose in 1928, that it will have another chance to win permanent possession of the cup in 1930, as that will be the fifth consecutive

race, since none was held in 1924, owing to the fact that no foreign nation sent challengers at that time.

The American team was not only handicapped by smaller engines and older planes, but also had lost one of its best pilots and best ships before the 1926 race. Lieut. F. H. Conant, who was killed a few weeks before the race, when a standard ship which he was flying struck a fishing-net stake while landing, had attained a speed of 251.5 miles per hour with one of the racers.

That left the 1925 winner, powered with a 700-horsepower engine, and another ship with a 600-horsepower motor. They faced the Italian seaplanes, with 800-horsepower engines.

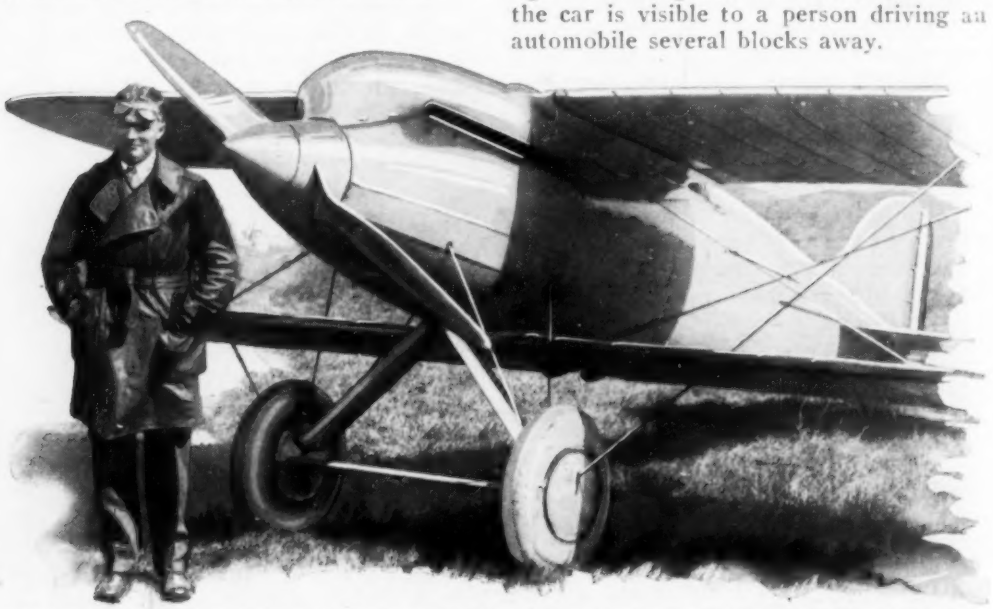
Italy's victory was also a triumph for monoplanes over biplanes. The little Macchi racer, which Maj. Bernardi piloted to victory at 246.4 miles an hour, had much the same fuselage lines as the American ships, but its single wing had sufficiently high lift, without the added resistance of the American double wings. Following the race, the same ship took the high-speed record away from the American army by covering a measured course at an average speed of 258.873 miles an hour. The previous record, made by Lieut. Doolittle, was 245.713 miles.

Flying at such tremendous speeds presents unusual difficulties. Pilots become momentarily unconscious while rounding the pylons at the corners of the triangular course, and, as they fly over the water, are always in danger of plunging into the sea. The racers are so small and fast that it is very hard to correct any minor deviation from the course without "overcontrolling," as the pilots say, and going too far in the opposite direction. The Curtis racers corrected this fault by gearing the control levers, giving a sort of vernier control like that on a radio dial.

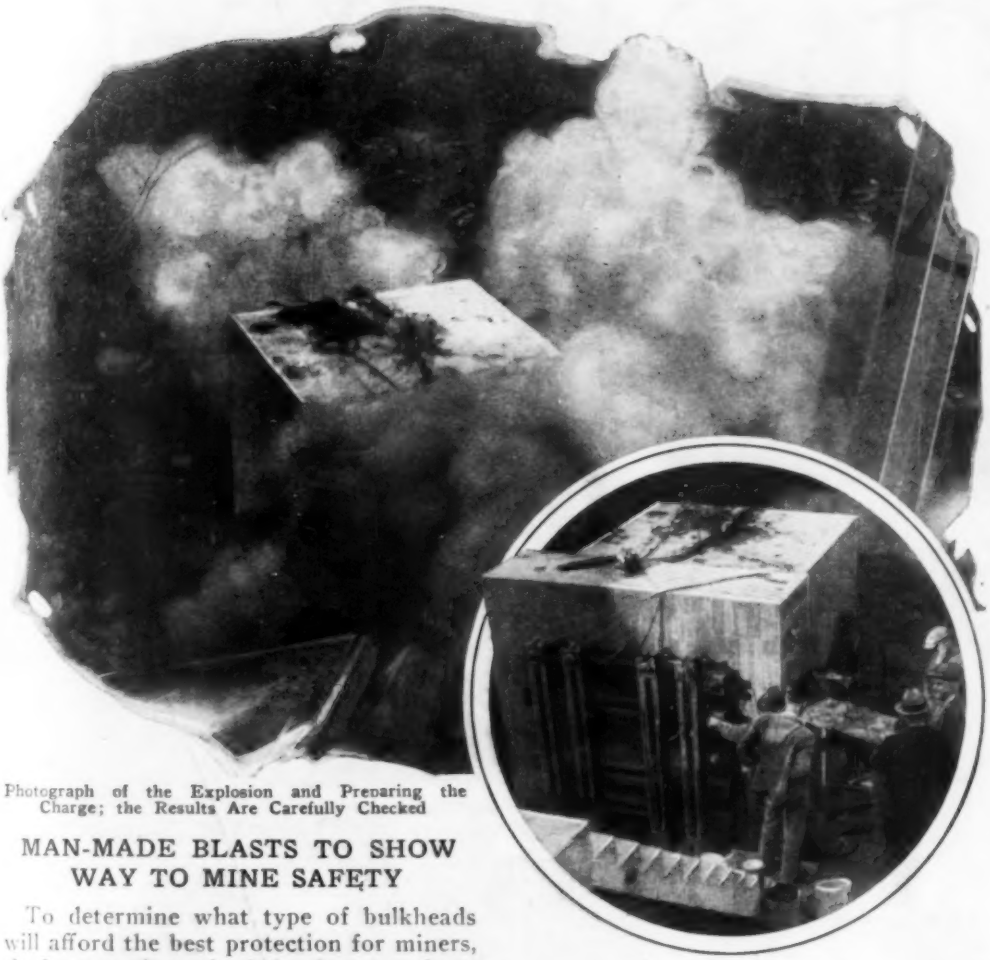
One of the oddities of high-speed flight, however, is that a stalled motor, even at very low altitudes, does not offer any particular danger. Flying at better than three miles a minute, the pilot can pull the stick back and zoom a thousand feet in the air if necessary, and there jump out and make a safe descent by parachute. The great speed is sufficient to hurl the plane, even with a dead engine, that high.

STREET CARS MADE VISIBLE AT NIGHT

For greater safety, some of the street cars in San Francisco have been painted white at both ends. At night, reflecting lights shine against the surfaces so that the car is visible to a person driving an automobile several blocks away.



One of the Curtis Ships Fitted with Wheels and Landing Gear as Used in the Pulitzer Race, When They Set the World's Speed Mark, Now Lost; the Pontoons Are Interchangeable with the Wheels



Photograph of the Explosion and Preparing the Charge; the Results Are Carefully Checked

MAN-MADE BLASTS TO SHOW WAY TO MINE SAFETY

To determine what type of bulkheads will afford the best protection for miners, the bureau of standards has been conducting a series of explosion tests in a special chamber. The results of the blasts are carefully studied as to their effect on various kinds of materials and the explosions are arranged with great ingenuity in order to duplicate as nearly as possible those that occur in mines.

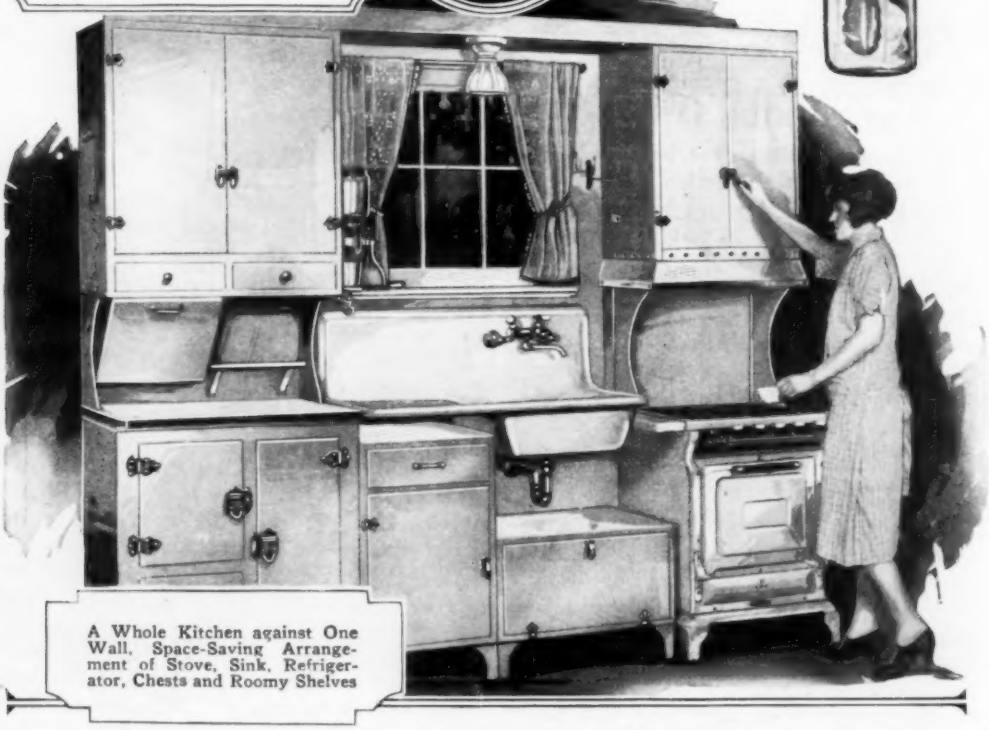
U. S. PROSPERITY IS SPEEDED BY INDUSTRIAL SAVING

British observers, sent to America in search of the secret of our prosperity, discovered two facts that surprised them. One was that we have increased the electrical output of steam-generating stations sixty-seven per cent in five years with only fifteen per cent increase in the quantity of coal consumed. The other was that railroad freight rates have been reduced and ton-miles of freight handled per employe increased, while the number of workers has been cut by nearly 100,000 men. The results attained in fuel conservation through extension of the use of electricity were even more surprising to the observers. They found seventy per cent of all power used in American factories is delivered to the machines through electrical wires, and the number of homes using electricity increased from 5,700,000 to 15,000,000. There was a forty-three per cent increase in water power—hydroelectric stations providing 8,300,000 of the total of 23,840,000 kilowatts generated in the United States. At the same time the improvement in efficiency of the coal-burning plants engaged in producing electric power cut the fuel consumption from three pounds per kilowatt-hour to two pounds.

To Save Work

Closely Resembling Linen, a Manufactured Product Is Made Up into Fancy Table Doilies That Can Be Scrubbed with a Brush

Clothesline on Metal Reel to Prevent Snarling, and, at Right, Combined Tongs and Bottle Cleaner



A Whole Kitchen against One Wall, Space-Saving Arrangement of Stove, Sink, Refrigerator, Chests and Roomy Shelves

Anyone wishing further information on devices described in the editorial pages can

in Your Home

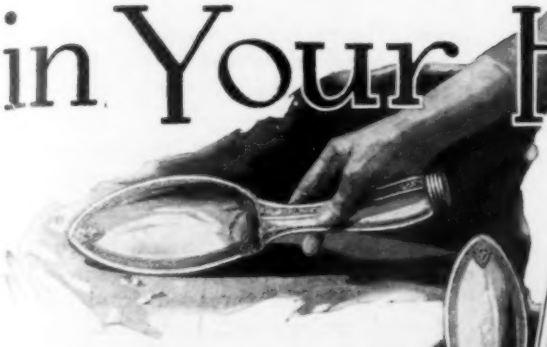


Table Scraper Is Emptied through the Handle and Prevents Scattering of Crumbs

Electric Heater for Rooms Operates from Light Socket and Is Arranged to Afford Ample Circulation for the Warmed Air

Combination Stool and Hamper for Soiled Clothes Fits in Small Corner of Bathroom; It Has Slits for Ventilating

To Relieve Floor Scrubbing of Its Drudgery, a Rest on Casters Protects Knees and Clothing

Lemon Squeezer and Strainer in One Simple Implement with a Hole for Hanging on Hook

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago

For the Safety of Street Sweepers; Belts with Red Glass Reflectors to Warn Motorists

REFLECTORS IN SAFETY BELTS GUARD STREET CLEANERS

Red-glass reflectors attached to the safety belts worn by street sweepers in Portland, Oreg., are intended to attract the attention of automobile drivers at night and thus help prevent accidents to the cleaners who work after sundown. It has been suggested that similar belts be worn by pedestrians abroad at night. There are two glasses in front and two in the back. Reflecting the light of street and other lamps, they are said to be visible at a considerable distance.

SHEEPSKIN "LUNGS" IN METERS PASS RIGID TESTS

Diaphragms used in gas meters are made of sheepskin, as this material has been found most suitable to the demands of accuracy and prolonged performance. In selecting the skins, about six are discarded for one taken, as they must be in excellent condition. Insect bites, scratches and other blemishes make them unfit for service. The skin is soaked in a heavy oil for ninety days to make it proof against the corrosive elements in the gas; then it is cut and attached to a tin-coated steel ring and is ready for its years of duty.

SECRETS OF EARLY MUSIC HELD IN MYSTERIOUS CURIO

In custody of the Boston symphony orchestra is a nameless musical instrument of dark-grained wood, shaped somewhat like a sword and threaded from end to end with strings set about two inches apart. It is part of a collection of ancient pieces and there is but one clue to its identity, a yellowed bit of parchment inscribed with tiny Chinese characters that have not been deciphered. It is thought that the instrument may have belonged to a period early in the history of music, when Chinese prisoners gave secrets of their ways of music making in exchange for their liberty.

"SHIP" AS REAL ESTATE OFFICE HELPS ADVERTISE LOTS

In keeping with the nautical name of a subdivision near Atlantic City, a real-estate office was built in the form of a ship. Erected on a wide expanse of open land, it was fitted to provide ample space for salesmen and customers.

Real-Estate Office Built in Form of a Ship to Advertise Subdivision

BLASTING OUT ONE OF THE WORLD'S LARGEST ROCKS

One of the largest single rocks ever quarried was blasted from Stone Mountain, Ga., to be used in making columns for the capitol building in Cuba. The huge "chip" was more than fifty feet high and contained 250,000 cubic feet, enough to fill 650 freight cars. Big as the piece was, it represented but a small part of the mountain itself, which is a granite bowlder rising to a height of more than 1,600 feet from a flat plain near Atlanta.

Blasting Huge Fragment from Stone Mountain, Ga., for Cuban Capitol Pillars

TEACHING BELLS TO SING

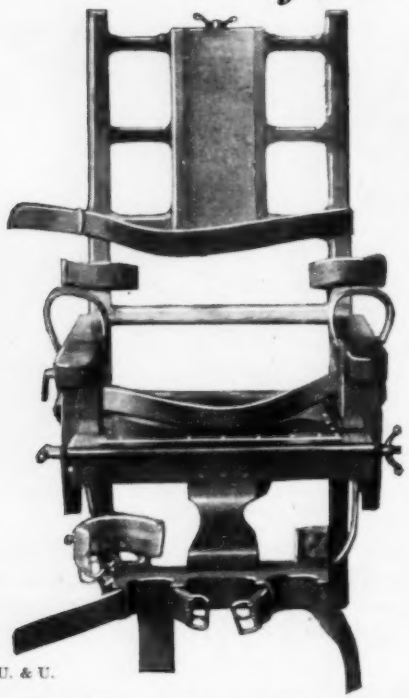
Carillons cost from $10,000 to $100,000, depending upon the number and quality of the bells, and casting them is a task requiring great skill. Some of the secrets of the old Flemish masters of the art are said to have been rediscovered so that the tones of a carillon of today compare favorably with those of bells made centuries ago. To achieve the exact tone desired, a few shavings may be removed from the interior of the casting with a fine tool. The bell then is given a dull gloss by means of a sand blast. No paint is used, as that would deaden the sound. The sound waves from some of the large bells are sufficiently powerful to shatter a wine glass a yard away. The heaviest bell in the carillon ordered for a New York church weighs nine and one-fourth tons and the smallest fifteen pounds. The sets contain from twenty-three to fifty-three bells. They are tuned to semi-tone intervals and are played with a set of levers arranged like the keys on a piano.

FIRE SIGNAL HAS LOUD SPEAKER TO SPEED ALARMS

The person turning in the fire alarm can speak to the men at the engine house and receive a reply, preventing mistakes in locations and other delays, in a signal box that has an amplifying unit for the voice. A loud speaker relays the fire call distinctly, so that the men at the fire station are called to attention, and the reply can be heard twelve or fourteen feet from the box. This feature is expected to discourage attempts to turn in a false call. Access to the signal is gained by breaking a glass panel as in the ordinary fire box.

It's easy to dodge Electric Shocks *(if you know how)*

By PAUL PADDOCK



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The Electric Chair at Sing Sing Prison, Showing the Helmet and Straps for Hands and Feet

WHILE electricity is still much of a mystery, it may be employed as safely as a stream of water from a hose—if you know how. Spray from an atomizer under many pounds' pressure would hardly cause more than a tingling sensation to the skin because the amount of the liquid is so small, but a stream from a fire hose under the same pressure might result in serious or even fatal injuries.

And so with electricity; its safe handling depends not only on the pressure, but on its amount. With water, the quantity is expressed in pints or gallons, and in electricity it is measured in "amperes." The pressure of water is told in pounds while in electricity the same force is counted in volts.

This explains why, although 2,000 volts and about seven amperes are used to kill criminals in the electric chair and shocks from the ordinary 110-volt, ten to thirty-ampere lighting circuit have often proved fatal, no more than a bad jolt results from coming in contact with the 10,000 volts used at the spark plug of an automobile. In the latter case the amount of current, or amperage, is too small to cause any or at least not serious harm.

Like water seeking the lowest level, electricity always takes the easiest route back to its starting point. It works its way through obstacles, lighting lamps and running motors, as a stream surmounts a paddle wheel which has been erected in its course to turn mill machinery. The path in which the current moves is called a circuit and, unless it is complete so it can return to its starting point, it can do no work and cause no damage.

The danger only comes when the current can make a circuit through the body in returning to its starting point. Thus, a repairman standing on an insulated platform through which electricity cannot

A Live Wire Generally Looks as Innocent as a Harmless One; Teach Children to Leave All of Them Alone

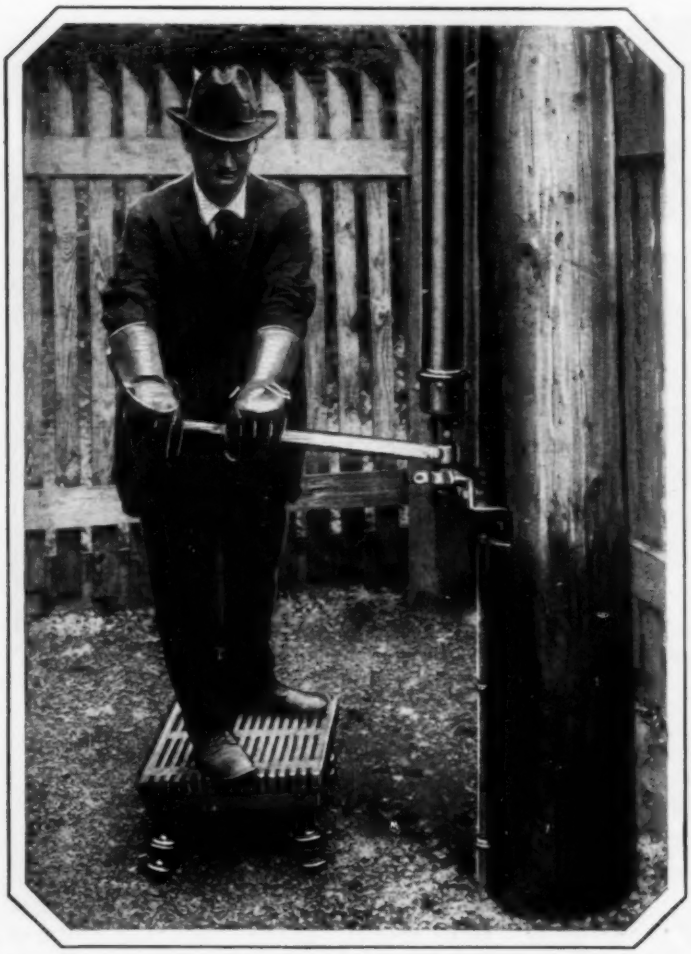
How Many Electric-Iron Cords Are Ruined, Leading to Shocks and Fires; Right, Diagrammatic Photo Tracing Path of Current from Faulty Light through Body to Water Pipe

pass, may handle a wire carrying 600 volts in perfect safety, whereas he probably would be instantly killed if he did the same thing while standing on the ground so that the electricity could make a circuit through his body.

When going through the body, electricity works just as it does when lighting lamps or running motors. Its disastrous effect on the human system is to contract the heart and lungs, stopping their operation, if there is enough current, and if the application is continued, the nerves are injured, chemical changes are caused in the blood and serious burns result. A person who has suffered an electric shock is in the same condition as one who has been asphyxiated, and artificial respiration should be applied for an hour or more before giving up hope.

Throwing strings, sticks or wires or flying kites over electric wires, and climbing poles that carry circuits are common hazards that children often take with disastrous results. If the kite string contains tinsel, as it often does, the danger is vastly increased. In the household, the electric iron has been found to be one of the chief trouble makers when not used carefully. If the current is not turned off, a fire may result. Care must be exercised, in handling the cord, not to kink or bend it. That ruins the insulation and may break the small wires inside allowing the electricity to escape just as water leaks out of a defective pipe. All appliances run with cord attachments should be handled with equal care. Exposed wires in connections to floor lamps are a common source of shocks and fires.

Makeshift fuse plugs often cause serious damage. The fuse is simply a protective device to safeguard against overloading the circuits in the home. It is the weakest link in the "chain." If the load becomes too heavy, that is, if too much



Guarding against Injury in Manipulating a Grounding Switch by Standing on Insulated Platform and Using Gloves

electricity flows into the wires, the fuse blows out. That shuts off the supply to the circuit, removing the danger of increased overloading. Putting coins, wires or other articles into the box in place of a blown fuse is hazardous, for more electricity than the wiring can safely accommodate is likely to flow in. The heating elements of toasters and percolators are likely to be melted and wires in the walls may become red-hot, causing fires.

When using the telephone, avoid touching radiators or other metal objects. In laundries, bathrooms or other damp places, never touch metal parts of lamp sockets, fixtures or other electrical devices that may be "alive." The hazard is greatly increased if the person is bathing in a tub, for more of the body is exposed to the water, which, being a good conductor, tends to draw off the full amount of current.

Radio dry batteries need not be feared, but even a six-volt storage battery may be the cause of a fire if the terminals leading from it become crossed. As battery eliminators are used in connection with the house-lighting circuit and develop high voltages, they afford a possible source of shocks. The metal parts of these units should never be touched when the current is turned on. Knobs, and other parts that need to be adjusted when the set is running, are properly insulated to prevent injury. In purchasing electrical equipment of all kinds, it is advisable to look for labels which show that the pieces have been properly tested before being placed on the market.

Never touch a person who has been shocked while he is still in contact with the live wire. Try to summon someone who knows how to do this, but if assistance cannot be obtained, use a long dry board, a dry wooden-handled rake or broom to draw the person away or remove the wire. Keep out of water and never use a moist object. In taking hold of a live wire, use only one hand and never touch a wet pole that is carrying electric wires.

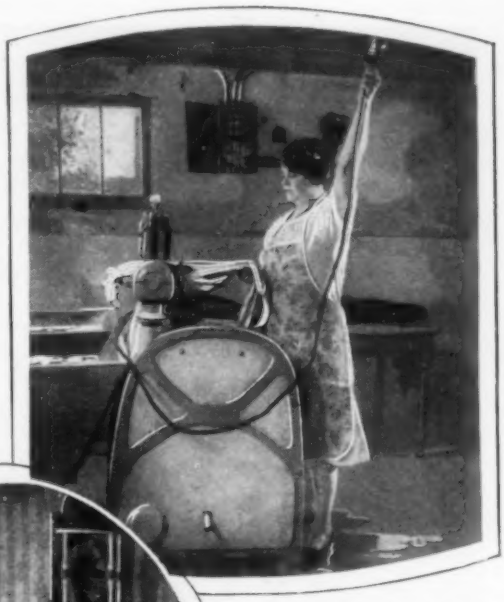
Shocks through the upper part of the body are likely to be more dangerous as they may pass through the heart and other vital organs. Always be wary of fallen wires on the streets, especially after storms where there is danger that the strands may be part of an electrical circuit or in contact with live wires. Don't touch

the worn spots on insulation, have cords and wiring inspected by competent persons, never try to take electrical shocks just to experiment and keep furniture away from interior wiring.

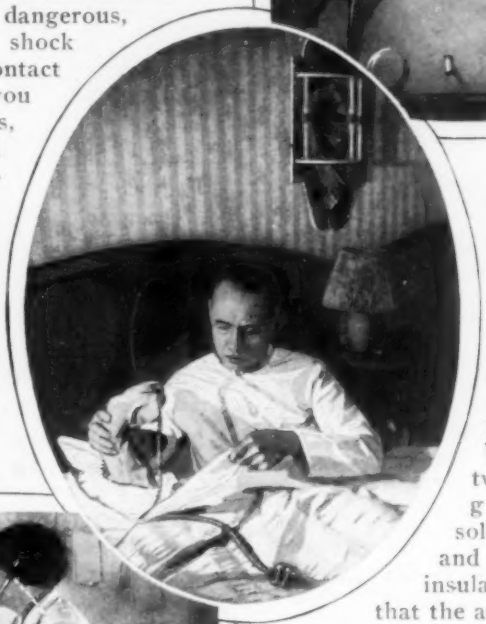
The effect of an electrical shock, if the current is of the alternating or interrupted type, is partly muscular, alternately contracting and loosening the muscles. That is why the current from an ordinary "shocking" coil seems to jerk the hands when you grasp the electrodes.

Most of the house-lighting current, outside certain business and factory districts in some cities, is of the alternating type, reversing its direction sixty times a second. Under ordinary circumstances it is not particularly dangerous, causing only a mild shock when you come in contact with the wire. If you grasped both wires, though, you would receive the full capacity passed by the house fuses, usually twenty to thirty amperes, which might be an exceedingly dangerous or even fatal amount. When you touch only one wire, the amount of the current which can pass through your body is limited by the material between you and the ground—your shoe soles, the carpet, floors and walls. Usually they insulate you so effectively that the amount of flow is small and the shock light. Occasionally you may read of some one being killed in his own home by the electric-light current. More often than not the victim is a woman, and the circumstances of death much the same. Usually the newspapers recite that, while taking a bath, the victim attempted to use an electric vibrator or curling iron, a circuit was established through the water and the water pipes to the ground, and a heavy enough current passed to cause death.

The water in the bathtub or washbasin makes a perfect ground for the same reason that you select a water pipe to ground your radio aerial.



A Too Frequent Cause of Shocks; Thoughtlessly Touching a Defective Wire While Standing on Wet Floor with Electric Washer Running



Don't Crumple the Electric Heating Pad; Fine Wires May Break, Causing Fires; Keep Hands Away from Water When Using Electric Curling Iron

Jewel-Studded Crown Which Was Worn by Catherine the Great of Russia and Is Now for Sale at Huge Price

FAMOUS RUSS CROWN VALUED AT FIFTY-TWO MILLION

Containing 1,520 diamonds and surmounted by a cross of huge jewels, the historic crown that was worn by Catherine the Great of Russia is valued at $52,000,000. It is included among the Russian crown jewels purchased from the Soviets. Another famous item is a large jewel given her by the Swedish king, in 1777.

FOLDING TABLE-AND-CHAIR SET FITS IN SINGLE BOX

Folding chairs and a table to match are provided for card parties, clubs and hotels in a compact set of five pieces that fit into a single small carton when not in use. The chairs, for instance, stack evenly and a dozen of them occupy a space only eighteen inches wide, three feet long and two feet deep. An additional feature is an ash tray that slips into a slot in any of the four legs.

Table and Chairs Set Up and Packed in Box; Note Ash Tray on Front Table Leg

FISH SURVIVE FREEZING TESTS

That many creatures can survive extreme cold is common knowledge, but a European scientist has made some interesting experiments showing that some species can endure even lower temperatures than is generally believed. A number of fresh-water fish were kept in a block of ice at a temperature of twenty degrees Centigrade below zero. When the ice was carefully thawed out, the apparently dead fish revived and swam in the melted water. Lower temperatures proved fatal to the fish, but frogs withstood colds of twenty-eight degrees, a water salamander, fifty degrees, and some species of snails endured 120 degrees.

HUNDRED-STORY BUILDINGS FOR STORES AND HOMES

Skyscrapers, 100 stories high and containing both offices and residences, will appear in large cities within the next fifty years, an eastern architect predicts. As he pictures the structures, fifteen floors would be devoted to business and the rest, set back in pyramid fashion at intervals of every three stories or so to admit light, would afford living quarters. Sidewalks at the various levels, with space for small stores, lunchrooms and other conces-

sions, plots for grass, trees and playgrounds, would be practical under such an arrangement, he declares. Skyscrapers of this type would occupy an enormous base and would be erected at intervals of one block, so that there would be relatively little obstruction to the view from any window of the upper floors.

Electrical heat would eliminate smoke and chimneys. The plan suggests new standards of health and efficiency in densely crowded cities, the architect believes.

DISK RECORD BENT DOUBLE WITHOUT DAMAGE

Flexible phonograph records have appeared in England and are said to be so elastic that they can be bent double, thrown to the floor and otherwise mistreated without injury. After one of the records had been bent, it was placed on the machine and listeners declared they were unable to detect any impairment in the reproduction.

© Keystone View Co.

OXYGEN HOOD AND CHAMBER AID PNEUMONIA VICTIMS

Oxygen Cabinet and, at Left, the Hood for Use at Cot

To check the spread of pneumonia, a New York physician has developed a hood for use in homes and a chamber for hospitals to simplify the administering of oxygen. They are said to be improvements over the old funnel method in many ways, particularly because from forty to sixty per cent oxygen can be given the patient while he rests in any position and for any length of time, whereas but twenty-two to twenty-four per cent oxygen could be administered through the funnel. The hood incloses the head and chest and is suspended from a standard which is mounted on a wheeled base. Celluloid windows on two sides and another in the roof admit light. Air entering the hood is filtered through soda lime to remove the carbon dioxide and is dried by passage over an ice cylinder. In the chamber, the flow of oxygen is regulated by a valve.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

To Simplify the Window Washer's Task; Outside Surface Cleaned from Interior with Curved Mop

CLEAN WINDOWS FROM INSIDE WITH CURVED STICK

Washing the outside of windows can be done from the interior with a special scrubber attached to a cane-shaped stick. The article, developed in England, is intended to serve as a substitute for ladders and to eliminate the necessity of standing or leaning in hazardous positions while washing outer surfaces. The cleaning unit can be easily changed.

SAILOR INVENTS AID TO MAIL DELIVERY

Mail delivery to moving steamers in the Detroit river from the floating post office there has been facilitated by the application of a sailor's invention. The letters and packages are carried by a small launch and although the boats cut their speed to half as the mail craft comes alongside, the line, thrown around the timberhead of the larger vessel, frequently has broken by suddenly coming up taut. The mail boat drifted away and no delivery could be made. This difficulty has been solved by the installation of special snubbing posts devised by the second mate of one of the large lake vessels. They are placed abreast of hatch No. 3 on loaded boats and amidships when the freighters are light. The importance of this device is realized when it is known that, during the season of navigation, the floating post office delivers 1,500,000 pieces of mail and approximately 9,000 telegrams and special-delivery letters.

UNDERGROUND POWER CABLES INSULATED IN OIL

Installation of two huge power cables carrying current from 132,000-volt generators recently installed in New York and Chicago raised a problem in insulation that was finally solved by filling the underground conduit with transformer oil, under pressure. The New York line is eleven miles long, and, as it supplies current for the high-pressure pumps of the fire-fighting system, the city requires the company to pay a forfeit of $400 for every minute the line is out of commission. The Chicago power line is six miles in length. Pressure on the insulating oil of the latter is maintained through connections with large oil tanks on top of buildings at several points along the route. The power company built the buildings merely to get the use of the roofs for the tanks, and then leased the lower floors as garages.

MODEL TOWER IS BUILT OF OLD NEWSPAPERS

Old newspapers have been adapted to a novel and ingenious use by a western craftsman. He soaks them in water until they are pulpy then pounds them into blocks with which he builds various models. The six-foot tower shown here has a small elevator inside which is run by a tiny motor. Several cigar boxes, some wooden crochet needles and more than 300 copies of a daily newspaper were required to complete the model.

Blocks in This Model Tower Are Made of Old Newspapers, Pressed into Shape after Soaking

A Crystal Set for the Boy Builder

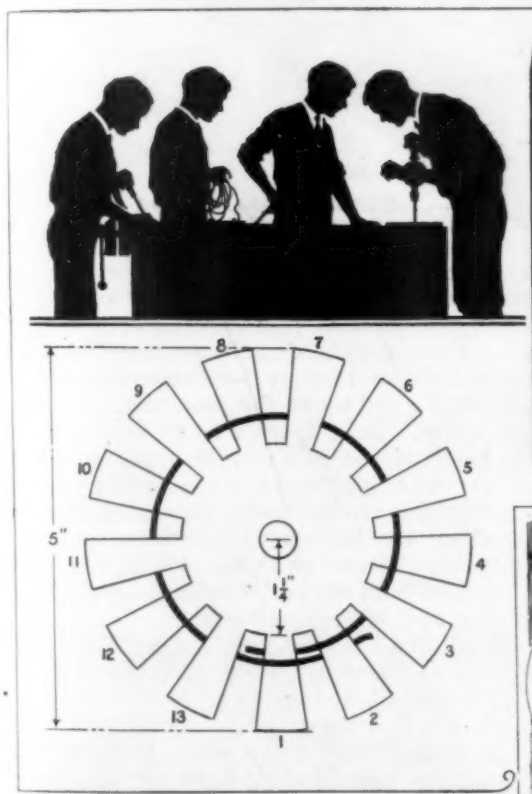
By WILL H. BATES

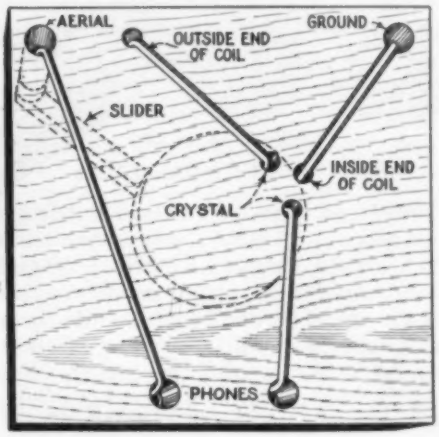
THIS little set is recommended for the boy builder, although the grown-ups also will enjoy it. Exclusive of the phones, the cost should not exceed $1. Surprising volume is obtained on the local stations, and the set is more selective than the average receiver of this type.

Very few parts are required. The wood base may be made of scrap material found around the home. The other items can be bought at the 10-cent store, with the exception of the crystal holder. For this, an upright type, as illustrated, should be selected, and may be obtained for about 25 cents. A good pair of 2,000-ohm phones should be used and these are available for about $2.50.

The base may be beveled on the top edges, sanded down, and then given a coat of mahogany or walnut stain. Drill it for the four binding posts, which are located as shown in the illustration of the under side of the base. A ½-in. bit is used to countersink these holes halfway through the board from below.

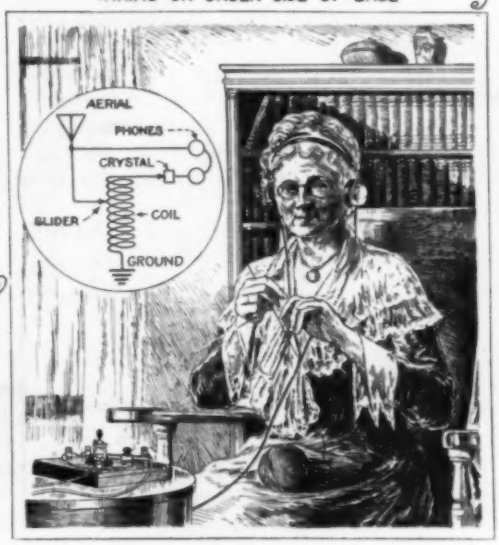
The spiderweb coil is wound on the form shown in the diagram; this form may be cut from fiber or cardboard, and the dimensions should be followed. The thirteen spokes are 1¼ in. long, leaving an uncut center 2½ in. in diameter. Wind the turns of No. 24 d.c.c. magnet wire alter-





WIRING ON UNDER SIDE OF BASE

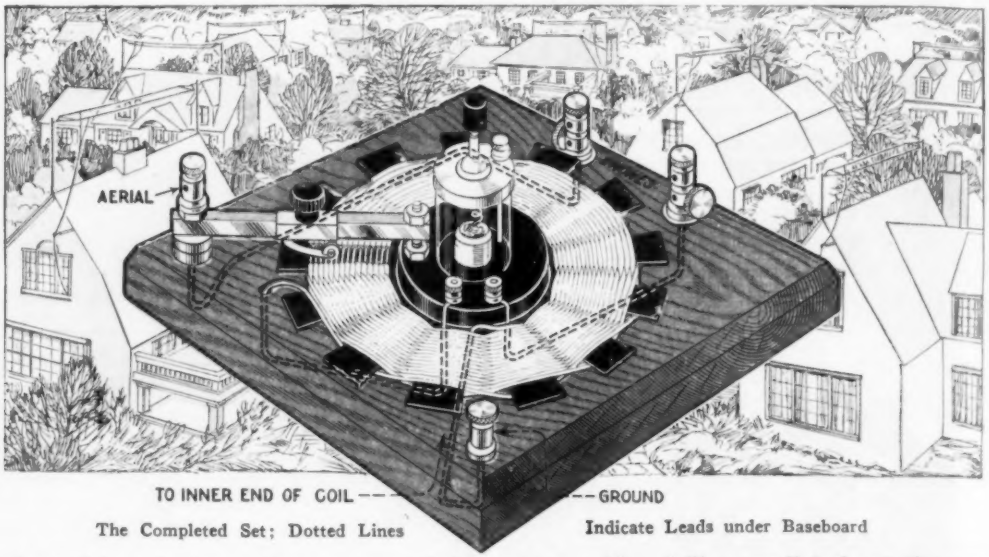
Left, Construction Details of Coil Form; Black Line Shows Method of Winding; Insert at Right, Schematic Circuit Diagram



nately over and under the spokes, as indicated by the heavy line. When doing this keep count of the turns by marking one spoke and counting one each time this is passed. Fifty turns are required. Leave about 6 in. of wire at the start and finish of the coil, to make the necessary connections to the binding posts. When the coil is completed, scrape off the insulation from the wires on one of the spokes for a space about ¼ in. wide, running straight down the spoke toward the center. Put the spiderweb form on the center of the baseboard with the scraped section of the wire pointing to the aerial post. Then place the crystal holder in the exact center of the spiderweb coil, with one of the screw holes for mounting the crystal holder in direct line with the scraped wire and the aerial post. Fasten down the holder to the base with a wood screw through the mounting hole on the opposite side of the crystal holder.

At the starting, or inside, end of the coil, drill a small hole straight down through the base, and on the under side, cut a groove in a straight line from this hole to the ground binding post. Run the inside end of the wire down through this hole and along the groove to the ground post. Also drill a small hole at the outside end of the coil, and another just in front of one of the binding posts on the crystal holder. Join these two holes with a groove, and bring the outer end of the coil down through the base, along the groove and up to the post on the crystal holder. Drill another small hole just in front of the other binding post on the crystal holder, and run a wire down from this side of the crystal, through a groove along the bottom to one of the phone posts. The other phone post is then connected with the bottom of the aerial binding post in the same manner.

With a hacksaw, cut off a section of the square slider bar, long enough to bridge the space between the base of the crystal holder and the aerial post. Measure the distance from the screw hole in the flange of the crystal-holder base to the aerial post, and drill holes in the slider bar accordingly. A 6-32 brass machine screw, 1½ in. long, is brought up through the baseboard, and through the opening in the flange. This hole is drilled down through the flange, using the hole in the crystal holder as a template. The hole on the under side of the base is countersunk for the head of this screw, which is



The Completed Set; Dotted Lines Indicate Leads under Baseboard

MATERIAL LIST

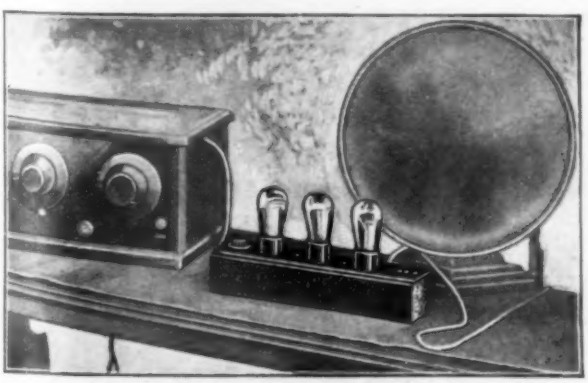
1 wood base, ¾ by 6 by 6 in.
4 binding posts.
1 spiderweb form.
1 small spool No. 24 d.c.c. magnet wire.
1 slider bar, 3 in. long, with slider.
2 6-32 brass machine screws, 1½ in. long.
1 wood screw, 1 in. long.
1 crystal and holder, upright type.
Washers and extra nuts.

not shown in the illustration as no circuit wires go to it. A nut is fitted on the end of the screw protruding through the holder flange above, and the slider bar slipped down on the nut, where it is held by another nut. At the aerial post, a brass machine screw of the same size is passed up through the baseboard, the lead from the phone post first being securely fastened to the head of the screw on the under side. Washers or a bushing should be used to level the bar. Put the slider on the bar and mount on the screw. The aerial binding post is then screwed down, and the set is ready for use.

To operate the receiver, use a one-wire aerial, about 75 or 80 ft. long, and connect a lead from the ground post to a clamp attached to a cold-water pipe. Then insert the phone-cord terminals in their posts. Tune by moving the slider along the bar until a station is heard at maximum volume and adjust the crystal to the spot where best results are obtained.

New Unit Brings Old Set Up to Date

A new power-amplifier unit that may be used to modernize the old set has lately made its appearance on the market. It consists of three specially designed stages of a.f. amplification in a compact assembly, which can either be placed inside the cabinet, if there is room, or used as shown in the illustration. The cable leads from the unit are merely clipped to the regular batteries of the set. The a.f. tubes are shifted to the unit and one tube is added. A special lead in the cable is provided for connection to the detector tube.



Power-Amplifier Unit Connected to the Old Set, Improves Tone, and Provides Increased Volume

Direction Finder for Loop

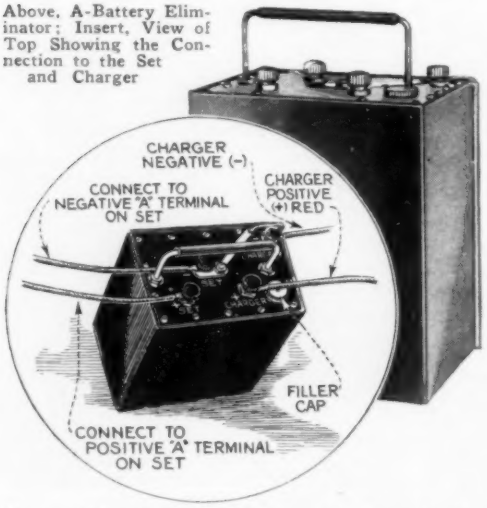
A handy device for pointing the loop exactly toward the location of a distant broadcasting station was exhibited at the recent Chicago radio show, and is now on the market. It is offered as a separate unit, or may be obtained in knocked-down form suitable for mounting in any set. The finder consists of a properly projected map of the United States, under glass, on which is mounted an arrow indicator. There are two control knobs on the instrument, a small one on the side, and a large one at the front. The first controls the arrow only; the second controls both loop and arrow. The first step in using the device is to swing the loop, by hand, until it points due north, as determined by the compass mounted near its base. Then, by means of the small knob, the arrow is also set to point due north on the map. Now, if the larger knob is turned so that the arrow points to the location of the station desired, the loop, swinging with it, will also point to the station, permitting the operator to tune it in at maximum strength.

Insert, Loop Direction Finder as a Separate Unit; Right, Built-In Type for the Set Builder

¶Do not use small B-batteries on large sets, nor large B-batteries on small ones.

Filter Eliminates A-Battery

Eliminating the A-battery, a new filter unit is attached to the output of a tungar charger, where it will perform enough


CHARGER NEGATIVE (−)
CONNECT TO NEGATIVE "A" TERMINAL ON SET
CHARGER POSITIVE (+) RED
FILLER CAP
CONNECT TO POSITIVE "A" TERMINAL ON SET

Above, A-Battery Eliminator; Insert, View of Top Showing the Connection to the Set and Charger

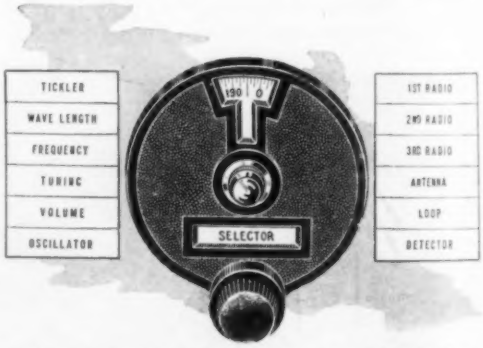
"smoothing" and filtering to permit the use of anything from a one to a ten-tube set. For sets employing from one to six tubes of the 201-A type, or equal load, a 2½-amp. charger is recommended and a 5-amp. for those using more than six similar tubes. Vibrator-type chargers are not recommended for use with the unit. As the device supplies no power, its output is limited by the capacity of the charger. The connections are very simple. Based upon an electro-chemical action, the new unit permits the set to draw its A-power direct from a light socket, without alternating-current hum.

Filling Holes in Radio Panels

The radio experimenter often wishes to try out new circuits that call for a change in dials and other equipment on the panel. These changes leave a number of unsightly holes that must be filled up if the same panel is used. Countersink the holes on both sides with a "rose-head" countersink after the panel has been stripped of all instruments. Get some black pitch or compound such as is used for sealing storage-battery cells, or for covering dry cells and melt it in a can over a flame. Lay the panel flat on a sheet of paper on the table, and pour the compound into the holes, leaving a slight surplus above the surface. In about 30 minutes it dries hard and may be rubbed down to the panel surface with fine sandpaper. To put a good finish on the panel, which may be covered with scratches, use powdered pumice and water, and rub with a block of felt, always rubbing the full length of the panel, never across it. Go over the entire surface and wipe clean with either a damp cloth or one containing a slight amount of oil. The filling compound will stay in place as the countersunk holes serve to dovetail and hold it. If any irregular spots are left, apply some of the compound to them, smoothing such places off with a hot soldering iron, and rub down as before.—Harold P. Strand, Malden, Mass.

New Universal Vernier Dial Fits All Condensers

A universal vernier dial designed for all types of variable condensers is now offered to the radio builder. This dial may be used for either right or left-hand and for 180° or 360° condensers. A numbered disk is fastened to each side of the rotating plate; to reverse the reading, the plate is simply turned around, making practically four dials in one. Directly under the degree number on the dial there is a logging window with plenty of room for writing in the station call letters, permitting the listener to tune in the station he wants without reference to wavelength charts. There is also a designating window below in which can be placed any of the various



Universal Vernier Dial Really Is Four Dials in One; List of Titles Available for Lower Window

titles shown at right and left of the dial in the illustration. A full set of these is included with each dial.

Twelve Dollars Builds This B-Eliminator

By ARTHUR KENNEDY

TWELVE dollars is indeed a low cost for a really efficient B-battery eliminator, capable of supplying upward of 135 volts at 20 milliamp. An eliminator of the usual design is expensive to build, specially constructed high-voltage transformers, rectifier tubes, filter chokes and condensers being required. This B-eliminator, without any step-transformer, makes use of a well-known principle whereby it is possible to obtain d.c. voltages almost double that of the 110-volt 60-cycle a.c. input. Electrolytic, or "colloid," rectifiers and condensers take the place of rectifier tubes and dry-pack condensers in this unit. They have several advantages; first high resistance to electrical breakdown, and second, extremely high capacity per unit of electrode area, making a simple and compact, as well as an economical, source of B-battery voltage. Many of the parts can be found in the average home, materially reducing the cost of making the apparatus.

Parts Assembled Ready for Cell-Forming Process

Before beginning the construction of the instrument read the whole article attentively, so as to understand each step thoroughly, have all the materials on hand and follow the instructions explicitly. The general construction details appear in the illustrations and, in a measure, are self-explanatory. For mounting the eliminator in one compact unit, the author used two ⅞-in. pine boards, 8 by 15 in. To the upper one, seven wooden disks, cut from similar material and just large enough to fit snugly inside the tops of the Mason jars, were nailed, or screwed, in the manner shown in the photo on this page. The disks were arranged in two rows, one of three and the other of four, the space left in the former being reserved for mounting the filter choke coil on the baseboard. The seventh jar contains the two by-pass condensers of the voltage divider, as will be noted on the simplified wiring diagram. The section diagram on page 303 gives the reader a detailed view of the top assembly. It will be noted that vent holes are drilled through the disks and top; these holes should be at least ¼ in. in diameter. The brass machine screws to which the aluminum and lead electrodes are fastened may be longer, so as to eliminate counterboring, if desired. A long soldering lug, of the round-hole type, is placed under the head of each screw for the circuit connections. After the wood disks are in place arrange seven pint screw-top fruit jars in position on the baseboard and put on the top. Four 1 by 1-in. wood uprights are then cut for supports at the corners; they should be of such length as to allow the wood disks to enter to their full thickness into the jars when the instrument is assembled.

The holes for the electrodes are then drilled 1½ in. apart, and the various lead

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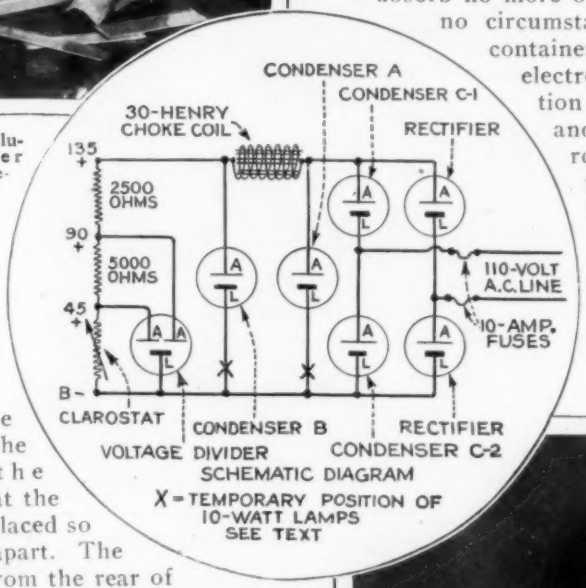


Above, Mounting Aluminum Condenser Plates; Center, Schematic Diagram of Circuit; Below, Pointing Out Taped or Insulated Portions of the Electrodes

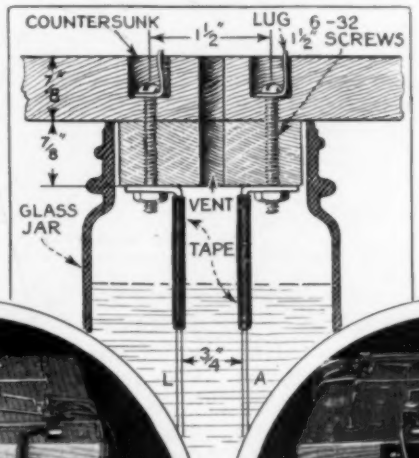
and aluminum electrodes are cut and mounted in their respective positions on the underside of the disks. Note that the electrodes are placed so as to be ¾ in. apart. The first two jars from the rear of the unit are for the rectifier cells. Each cell has one lead and one aluminum electrode, 1 in. wide, 4⅜ in. long, and about 1/16 in. thick, the actual thickness being of little importance, just so that it is not too thin. These strips should be thoroughly cleaned with emery or sandpaper before using, and this applies to all aluminum and lead strips in the unit. The electrodes are bent over about ½ in. at the top and trimmed so as to fit the disk. They are then drilled and mounted on the disks, as shown in the upper photo on this page, by means of the brass machine screws and held in place with a brass nut. The rectifier electrodes are then rubber-taped, or coated for 1½ in. from the top with PBX paint. This is done to prevent surface sparking, which would cause pitting of the aluminum plates. This method of insulating is carried out on all the electrodes as pointed out in the lower photo.

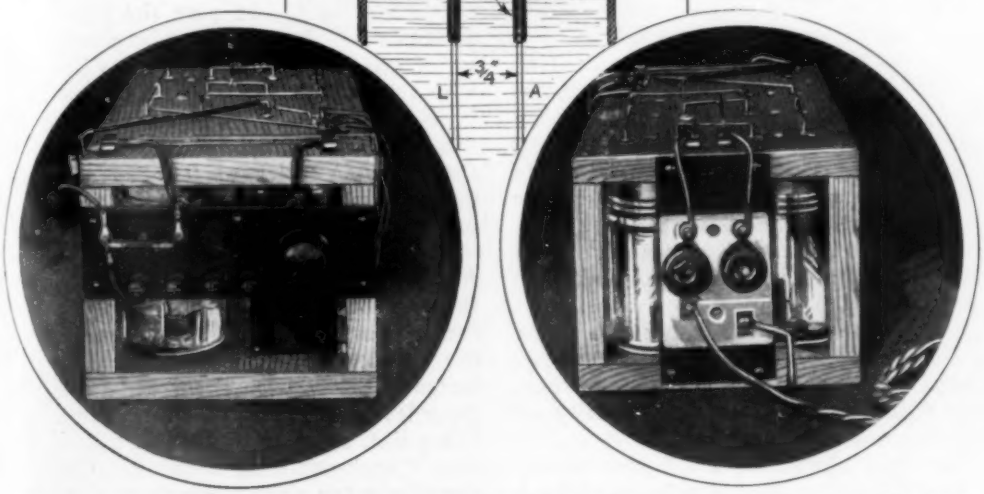
The solution for both the rectifiers and condensers of this eliminator is the same. One gallon of distilled water is necessary and it is very important that it be distilled. If in doubt, drop a few crystals of nitrate of silver in a small sample of the water. If the water turns milky, do not use it. To the gallon of distilled water add about 1 lb. of good borax or ammonium phosphate to make a saturated solution, which is obtained when the water will absorb no more of the solid. Under no circumstances use a metal container for making the electrolyte; mix the solution in a glass vessel and stir with a glass rod, to aid the water to dissolve the solid. Fill each rectifier jar with the saturated solution to a point where it covers about a third of the area of the

taped portion of the plates. We are now ready to form the two rectifier cells; up to this point these cells will not rectify a.c. current.

Taking each cell separately, make temporary connections to the lugs on the top, with lamp cord, so as to place the cell across the 110-volt a.c. line and connect a 25-watt lamp in one side of this line in series with the cell. Turn on the current and let it flow for a few hours. This is the forming process and changes the nature of the cells, which previously would have passed current in either direction, so that they will pass current in one direction only. As the cells form, the aluminum plate will turn a very light gray, where it is exposed to the action of the solution. This aluminum-oxide coating insulates the lead from the aluminum plate when the current attempts to pass from the latter to the former, but acts as a conductor when the current passes in a reversed direction. If a rectifier cell refuses to form, the aluminum plate will turn a dark sludgy-looking gray. If, after three hours of forming, the aluminum has not turned to a light gray, but instead is dark and dirty-looking, it is an indication that directions have not been followed closely enough. The cause is either unclean electrodes, impure water or low-grade aluminum. The aluminum plate must be pure and free from grease and foreign matter before it is placed in the solution. If a cell does not form properly, take the electrodes from the solution, dry them and go over them again thoroughly with emery cloth. Put them back in the solution and repeat the forming process. If after doing this the cell refuses to form and if you are sure that the water used is really distilled, the trouble is due to impure aluminum. Chemically pure sheet aluminum cannot be obtained in the open market, but commercial sheet aluminum of a good grade is pure enough for our purpose and can be bought in any hardware or plumbers' supply house.

If your cells have refused to form and you have been using borax in the solution, try changing to ammonium phosphate; it is a little more difficult to obtain but your druggist can procure it for you through his wholesale house. In a few cases the author found that the borax was at fault, a possibility that seems quite remote. After the rectifier cells have both been formed, take the electrodes out of their jars, dry them and coat the taped or painted section of each electrode with vaseline. Also





Above, Section Diagram Showing Method of Mounting the Electrodes; Left, Front View of Completed Eliminator; Right, Rear View Showing Fuse Block in Position

coat the bottom of the wooden disks and the inside of the jar, for ½ in. down from the top, with vaseline. This will prevent the borax or ammonium phosphate from creeping. Replace the electrodes in the jars and through the vent hole drop a little kerosene, just enough to cover the surface of the solution. This is done to prevent too rapid evaporation of the electrolyte.

Next comes the preparation of the electrolytic condensers, of which five will be needed. The tank condensers, C-1 and C-2, are arranged as shown in the schematic diagram on page 302. They are 8 mfd. each. At a forming voltage of 110 volts, exactly 8 sq. in. of the aluminum plate must be exposed to the solution; no variation is permissible here. The condensers are constructed and formed in exactly the same way as were the rectifier cells.

The aluminum plates are 2 by 6 in., and are bent over ½ in. at the top for fastening to the wood disk, leaving 5½ in. free, of which 1½ in. is taped or painted as with the rectifier cells. Bend back the ends of the aluminum plates so that they will not strike the bottom of the jars, but do not let the two surfaces touch each other. The aluminum plate goes to the positive side of the line in all cases.

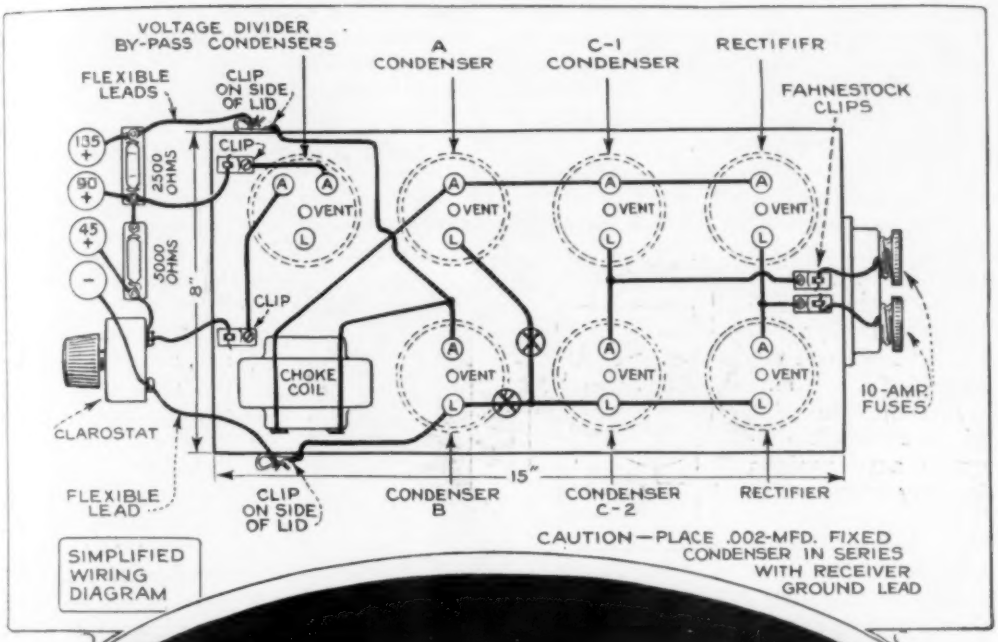
The filter condensers, A and B, shown next after the tank, or C-1 and C-2, condensers on the wiring diagram on page 305, have the same aluminum plate area of 8 sq. in. exposed, as the tank condensers, but, being formed at a high voltage, they will have just half the capacity of the tank condensers.

The lead electrode of all condensers, tank, filter and voltage divider, is ½ by 4 in. long. Make sure that the taped portion of the lead electrode goes below the surface of the solution, otherwise there will be very pronounced surface arcking. In forming the tank condensers, connect each one to one of your already formed rectifier cells. Connect each individual unit in series with a 10-watt lamp to the 110-volt a.c. line. That is, connect the lead electrode of each rectifier cell to one side of the line, and the aluminum electrode of the rectifier cell to the lead electrode of the condenser to be formed. The other terminal of the condenser is connected through two 10-watt lamps to the other side of the line. Each forming unit should be made separately, so that any error in preparing one cell for forming will not affect another that has been carefully prepared.

After the tank condensers have been properly formed, vaseline the electrodes, the bottom of the wood cover, and the inside of the jar from the top as with the rectifier cells. Then wire the eliminator as far as the filter choke coil; connect an unformed A or B filter condenser in series with two 10-watt lamps, at points marked X in the schematic diagram. Follow the diagram closely and be sure to connect the lamps in series, as there is 220 volts d.c. across the filter condenser at this point. Place the fuse block in the a.c. line, turn on the current and form as before. After forming, replace the formed A or B filter condenser with the other unformed filter condenser, and form it. As the filter condensers form, the 10-watt lamps in series with them will gradually grow less brilliant and finally go out. At this point, short one of them out of the circuit and continue forming. Connect the eliminator right through to the voltage divider, just as soon as both the filter

MATERIAL LIST

7 pint Mason jars.
1 gal. distilled water.
1 lb. borax, good grade.
1 sheet aluminum, 6 by 14 by 1-16 in.
1 sheet lead, 6 by 6 by 1-16 in.
1 Clarostat.
1 fixed resistor, 2,500 ohms, with mounting.
1 fixed resistor, 5,000 ohms, with mounting.
1 Thordarson, or similar type, 30-henry filter choke.
6 Fahnestock clips.
1 porcelain fuse block.
2 10-amp. fuse plugs.
4 binding posts.
1 piece bakelite, 3-16 by 3 by 6½ in.
1 piece bakelite, 3-16 by 2½ by 8 in.
2 pieces of wood, ⅞ by 8 by 15 in.
4 wood uprights, 1 by 1 by 5⅛ in.
2 porcelain-base sockets, for lamps used in forming process.
6 ft. lampcord with plug.
15 6-32 round-head brass machine screws, 1½ in. long.
Wood screws, rubber tape, soldering lugs, busbar wire, etc.



Above, Simplified Wiring Diagram; Below, Completed Eliminator Ready for Use

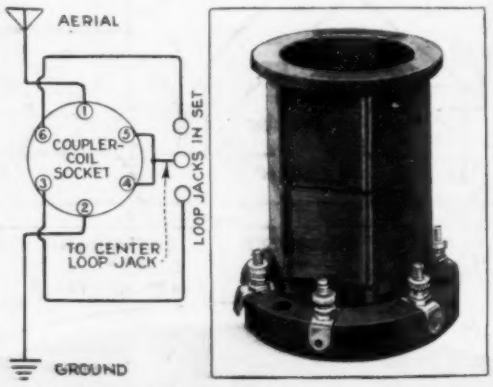
condensers have been completely formed.

The fixed resistors of the voltage divider are mounted on a strip of bakelite screwed to the front uprights of the unit, as shown in the left-hand photo on page 303. The 2,500-ohm resistor is mounted on the front at left, and the 5,000-ohm at the center on the back of strip. Shunted directly across the detector-voltage terminals is a "clarostat," which is mounted on the strip at right. This variable resistance is to form an artificial load, so that, regardless of the number of tubes in the set, the voltages at the terminals will always remain the same. Even if your receiver does not require 135 volts, do not omit the 135-volt binding post and its resistor. Build it just as it is and use the 90-volt terminal for your set; you may need the 135 volts at a later date or on some other set. The by-pass voltage-divider condensers are built in the same jar. The two positive aluminum electrodes are 1 by 6 in. and the lead electrode is ½ by 4 in. Prepare the plates as before, bending back and mounting the aluminum plates, side by side and ⅛ in. apart. To form, first tie the two aluminum plates together, and place the cell, in series with a 25-watt lamp, across the 110-volt a.c line. Form-

ing is complete when the aluminum plates have turned a light gray. Connect in the voltage divider and condensers and run the various voltage leads to the binding posts arranged along the lower edge of the bakelite strip at front.

It will be noted that six Fahnestock clips are mounted on the top and edge of the lid, to take flexible leads from points below, so as to facilitate removing the top. These flexible leads and clips are clearly shown in the simplified diagram.

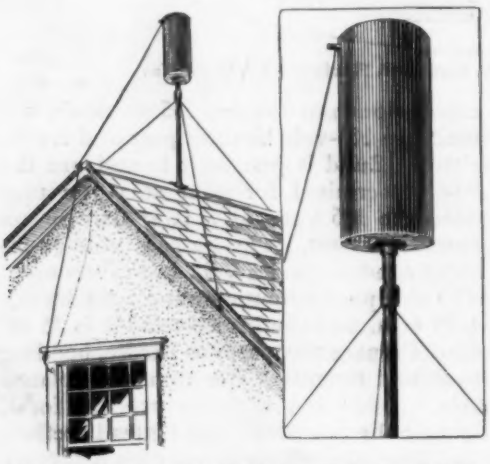
A large blueprint of the circuit diagrams and various forming steps outlined in the text has been prepared and may be obtained from Popular Mechanics Magazine Radio department, 200 E. Ontario st., Chicago, for 15 cents, to cover postage and packing. Specify blueprint No. 117.



Left, Diagram of Connections, Showing the Numbered Posts on the Coil Socket; Right, Plug-In Coil

Non-Directional Aerial

A new type of non-directional aerial does away with long unsightly wires and guys, is compact and can be installed in crowded localities where it would not be practical to use an aerial of the usual type. Being non-directional, stations from all points of the compass come in with equal volume. It is made of copper in the shape of an 8 by 10-in. cylinder and is mounted on an insulated pole.



Non-Directional Aerial Consisting of Copper Cylinder Mounted on Insulated Pole

Aerial Adapter for P.M. Superhet

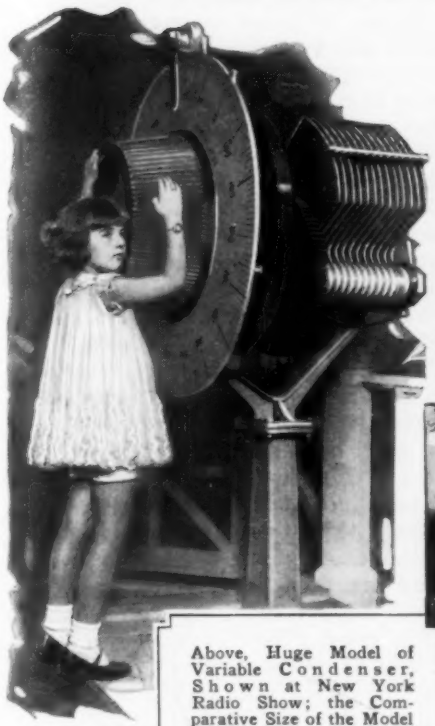
Numerous requests for information regarding the use of an outdoor aerial with the new Popular Mechanics superheterodyne, described in the October, 1926, issue, are answered by the simple device shown in the diagram. The set is designed for a loop of the three-tap type, and should not be used on an outside aerial, except for extreme long-range experiments, as, over ordinary ranges, the set would tune too broadly on an outdoor aerial. The plug-in coupler is the S-M type 110-A, with S-M universal socket and is shown in the photo. The binding posts on the socket are numbered as indicated on the diagram, and should be connected as shown. This aerial-coupler device should not be mounted in the set; it can be assembled on a small wood base and placed near the set when required.

This superheterodyne gives excellent results on the loop, and there is no reason for the use of an outside aerial except for experimental purposes. Any superheterodyne used on an outdoor aerial will reradiate, causing interference.

Denatured Alcohol Cleans Hydrometer

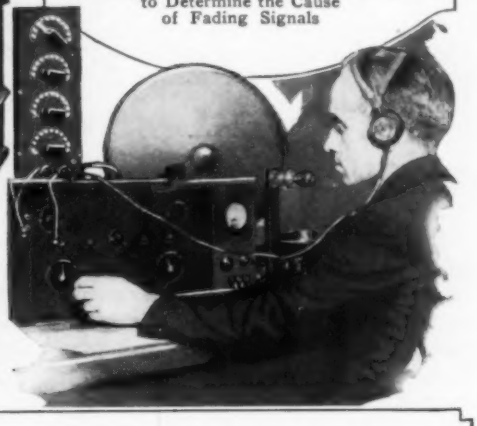
After continued use, the hydrometer becomes difficult to read due to a deposit of fine particles in the acid on the inside of the glass barrel. This deposit may be removed with wood alcohol. Provide a special bottle for the alcohol as it can be used over and over. Draw up the alcohol in the barrel of the instrument and squirt it back into the bottle; this simple method keeps the glass clean, so that graduations on the float stem can be easily read.

Facts and Fads for Radio Fans



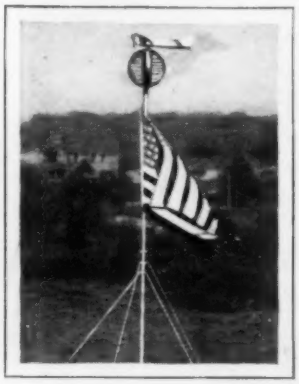
Above, Huge Model of Variable Condenser, Shown at New York Radio Show; the Comparative Size of the Model Is Indicated by Little Miss Betty Sargent Who Is Trying to Operate It

Henry P. Englehardt, a Chicago Artist, Putting the Finishing Touches on an Elaborately Decorated Portable Set; Below, S. S. Kirby, of the U. S. Bureau of Standards, Is Shown Conducting a Test to Determine the Cause of Fading Signals



Left, Six-Tube Radio Set, Built in a Baby-Grand Style; It Fits into a Corner and Attracted Favorable Comment at Radio Show in Chicago

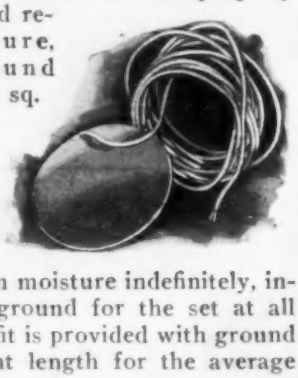
Flag and Vane Top Aerial Mast



The usually plain aerial mast may be improved in appearance by utilizing it as a flagpole, and also as a support for a weather vane if desired. A pulley should be arranged for raising and lowering the flag. The photo shows such an installation that is visible for many miles, and has aroused much favorable comment.—Raymond Hadley, Fairfield, Conn.

Ground Disk Retains Moisture

A metal ground disk, containing a chemical compound that has the property of attracting and retaining moisture, provides a ground contact of 175 sq. in. of metal, highly sensitive to radio-electric energy. The chemical in the disk is claimed to retain moisture indefinitely, insuring a good ground for the set at all times. The outfit is provided with ground wire of sufficient length for the average installation.

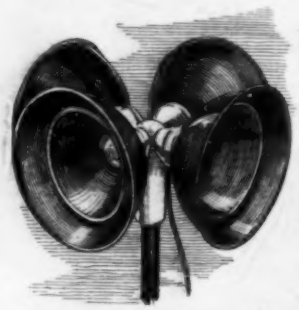


Loose Connections Frequent Cause of Trouble in Receivers

Loose connections are a common cause of trouble; they may be present in a new set fresh from the factory, or may develop in a set that has given good service. This often happens in shipping and is not due to faulty workmanship; the stiff busbar wire used in the circuit is not flexible enough to withstand heavy strains, and breaks in the soldered connections are not uncommon. In the home-built set breaks often occur when the set is removed from the cabinet or subjected to unskillful handling. If loose connections are suspected, pull each wire separately until the loose joint is located, and apply the soldering iron at once. Too often the solder is depended upon to keep the connection secure, but this is not sufficient. Butting two wires together and applying solder makes a poor electrical connection, and one having a high resistance, even though the solder holds. Always loop the wire around and pinch the loop tight on the wire to be connected before applying the solder. This will not pull loose. Have all wires perfectly clean before attempting to make a joint. Now that under-subpanel wiring is in vogue, stiff busbar wire need not be used for the entire circuit, as it is hidden below the subpanel. Stranded insulated wire may be employed, although this is not always advisable because of the high resistance offered if one strand escapes the solder. Soft drawn No. 16 copper wire, carefully insulated with a good grade of spaghetti tubing, will give excellent results.

Radio Antenna of Unusual Design

The illustration shows an antenna of unusual design that has recently made its appearance on the market. The four large receptacles are 10 in. in diameter and the smaller ones 6 in., and the eight together have 854 sq. in. of receiving area. The unit is made of conductive weatherproof material, and the center piece, or junction member, is of porcelain, insulating it from the mast. To install the aerial, a piece of ordinary ¾-in. pipe, threaded at both ends, is required, together with a base fixture that may be obtained at any radio-supply store. A pipe, 6 ft. long, is suggested if the unit is to be installed on the ridge of a house. The claim is made that this type of antenna has many advantages in that it is more selective, minimizes interference and is not directional.

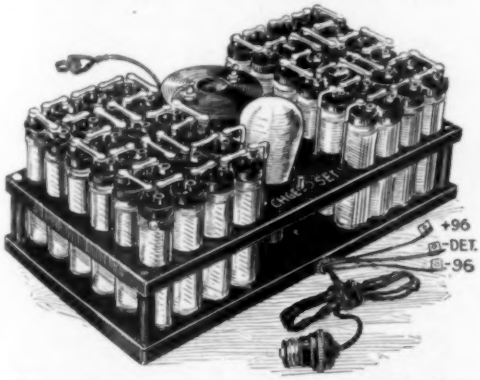


When Local Signals Fade

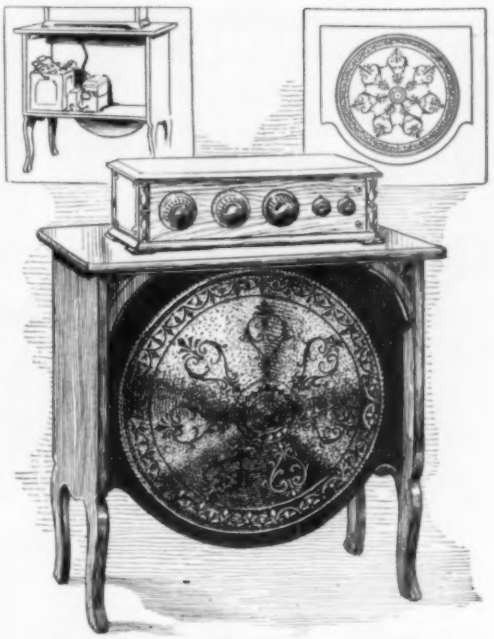
Fading signals are not always confined to the distant stations; it sometimes happens that signals from the local station behave similarly. The trouble is not in the strength of the signal but usually lies in a defective rheostat. Adjust the rheostats and watch the filaments of the tubes; the flickering or dimming of a tube when a certain point on the rheostat is reached indicates a loose connection that will cause this peculiar fading effect. Take off the rheostat, clean the resistance wire with a small piece of emery cloth and bend the contact arm so as to obtain a good contact at every point. Upon replacing the rheostat, no more trouble will be found as far as local stations are concerned.

Storage B-Battery Has Built-In Charger Unit

A wet B-battery with a built-in charging unit is now available. Two gravity balls, located in one cell, indicate the state of charge. When recharging is necessary, the switch may be thrown and the noiseless charger brings the battery back to full charge. There are no wires to disconnect. The rack is constructed of steel, finished to harmonize with the brown porcelain cell tops, and rests on rubber feet. The clip shown at the top is provided to enable the detector voltage to be varied; the extension cord and plug may be permanently attached to a light socket. Leads for the set connections are also provided, and the unit is a complete source of B-battery supply that is easy to keep at maximum efficiency.



Storage B-Battery Showing Built-In Charging Unit



Console with Cone Loud Speaker; Above, Rear View, Showing Battery Compartment and Cone with Sounding Board Removed

Console Front Is Cone Speaker

An attractive console with a 22-in. cone loud speaker and sounding board forming the front of the cabinet represents a new note in design. The speaker with its spruce sounding board may be quickly removed to permit access to the batteries and charger, as shown in the inset at the upper right. The rear view, at the left, shows the battery compartment. Ample room is provided for accessories, and the back is left open to provide good circulation around the batteries. This unusual combination is pleasing in appearance, and the tone of the speaker is said to be exceptionally good.

Potentiometer for R.F. Tube Control

To control the oscillating tendencies of the r.f. tube, a potentiometer offers a method that is advised unless some other form of control is provided. The potentiometer should be placed across the A-battery, and the movable arm put in the grid circuit of the first tube. If the negative return of this tube is connected to the ground, it should be removed before the potentiometer is put into the circuit.

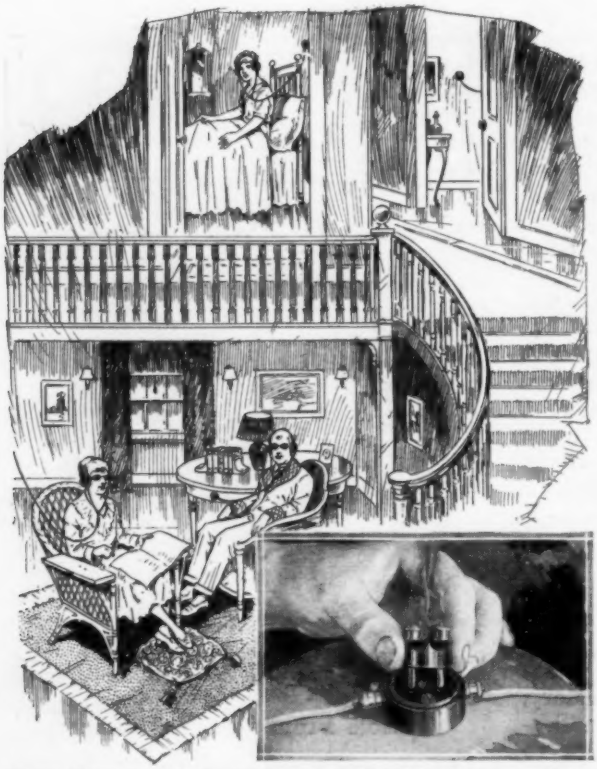


Photo Shows Plug Being Inserted in Jack, While Illustration Indicates a Variety of Applications in the Home

Radio Jack for Inter-Room Connections

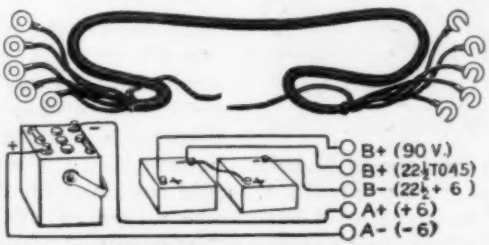
The new radio jack, of English origin, shown in the illustration has many useful applications. With it, a loud speaker or phones can be installed in any room in the house. The plug is so designed that the connecting of another speaker or pair of phones does not interfere with any others that may be in use at the same time. It consists of two parts, a circular base and an adapter fitted with two pins. The former is of hard rubber and provided with two brass pins, the ends of which carry terminal nuts. One pin is fixed, while the other may be slid in or out for a fraction of an inch, and behind the sliding pin lies a small spiral spring capable of exerting a pressure of seven pounds. When the plug is withdrawn, the spring forces the moving pin against the fixed pin, closing the circuit and shorting out the jack. When the plug is inserted in the jack, the pin is forced out, and the current from the set takes the path through the additional phones or loud speakers. The jacks may be mounted under tables, in cupboards or on the wall, and the connecting wires hidden. Small jacks of the same type may be mounted on the subpanel of a radio set, wherever a lead is to be broken occasionally. For instance, they may be included in plate leads of tubes, to permit a milliammeter to be inserted, or they may be used as lightning arresters and aerial connectors.

Choke Coil for Reducing Squeals

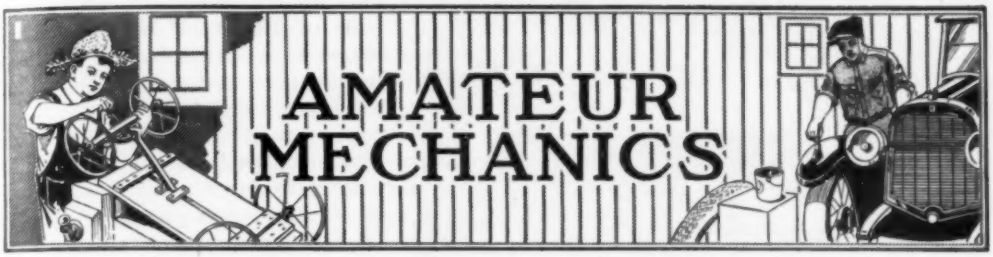
A regenerative set subject to howls and squeals can often be materially improved by the addition of a choke coil placed in series with the primary of the first a.f. transformer. The lead from the plate of the detector tube to the P-post on the a.f. transformer can easily be traced, and it is a matter of a very few minutes to install the choke coil. These choke coils can be purchased or made by winding from 150 to 200 turns of No. 30 s.c. wire on a bakelite or cardboard form, 1 in. in diameter.

Battery Cable Simplifies Wiring

Battery cables with various-colored leads greatly simplify wiring, the colored leads acting as guides to reduce the risk of error. These battery cables can be obtained in 5-ft. lengths, with five covered leads inclosed in one fabric. They are provided with five lugs or three lugs and two storage battery clips.



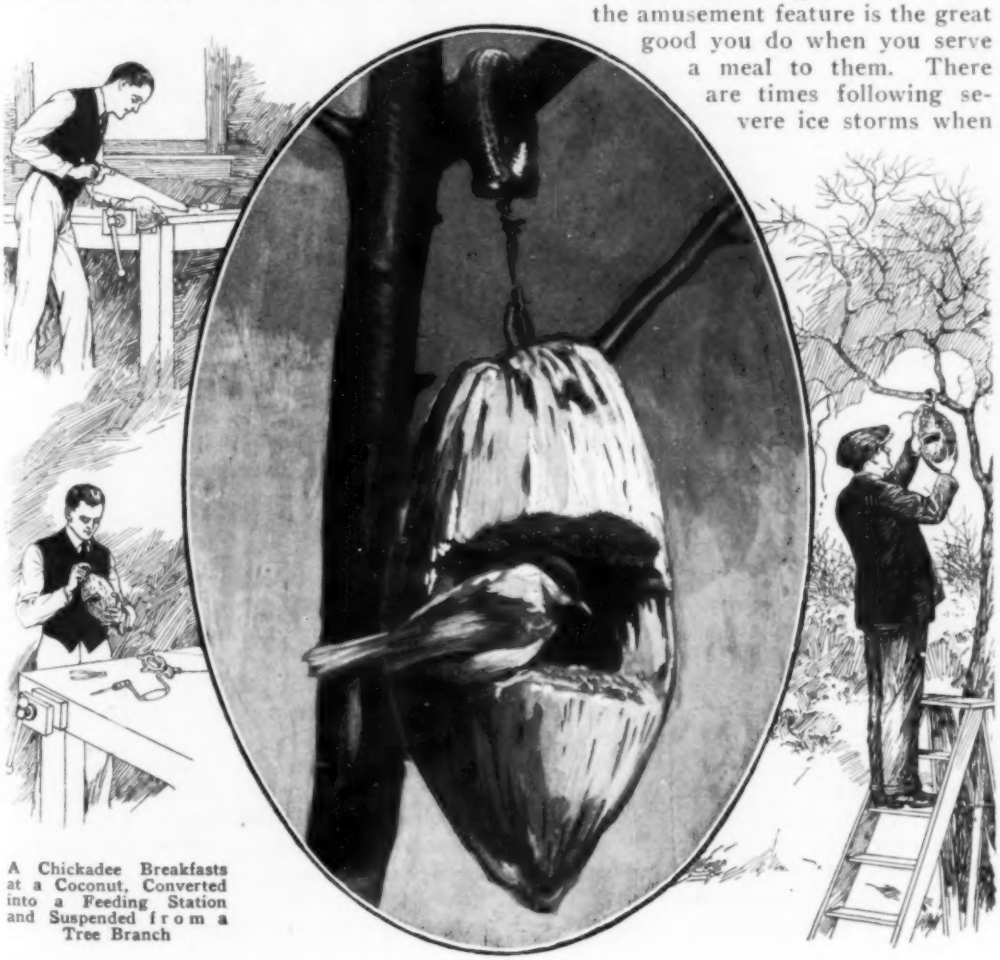
Battery Cable with Five Colored Leads, and Diagram Showing Battery Connections



Feeding Stations for the Birds

By BOB BECKER

AMONG winter pastimes that grow in popularity with adults and youngsters, operating a "bird cafeteria" is gradually forging to the front because of the genuine amusement the outdoor-restaurant owner enjoys. When winter comes, our feathered friends can be induced to stay around the backyard or orchard of a suburban dwelling, or kept close to the barnyard of the farm, by the establishment of feeding stations to which the hungry birds come for food. Quite aside from the amusement feature is the great good you do when you serve a meal to them. There are times following severe ice storms when



A Chickadee Breakfasts at a Coconut, Converted into a Feeding Station and Suspended from a Tree Branch

A Weather-Vane Feeding Station Is Easily Made by Any Boy, and Provides Constant Protection for Both the Food and the Birds

a handful of grain means the difference between life and death to such a bird as the bobwhite or quail.

The simplest kind of feeding station is an inexpensive suet holder. Beef or mutton suet is the cheapest and best food for insect-eating winter birds. It does not freeze or spoil, produces a lot of heat and is nourishing. The clownish bluejay, the little black-capped chickadee who sings ever so cheerily even on the coldest days, the red-headed woodpecker, the screech owl, the nuthatch, known as the "upside-down bird," the downy woodpecker, and many other birds, are fond of ordinary suet. If you put out a few chunks of this inexpensive but highly appreciated food this winter, you will be surprised at the number of birds that will visit you daily.

You can make a suet holder at home. Take a piece of ½-in. netting and make a holder 6 in. wide, 8 in. high and 2 in. deep. If some of the wires at the corners stick out, so much the better. Your feathered boarders will perch on these as they get a square meal. Nail this holder to a flat board about 3 in. wide, and tack a piece of old leather, tin or a strip of rubber from an old inner tube, over it as a cover. Anything that will shed rain and snow will do. Attach the holder to the south side of a tree. If there is a tree close to a sitting-room window, put it there, and you will have lots of fun watching the birds.

An even simpler method of bringing the birds close to you is the following: Buy a piece of suet, about one pound in weight, and tie it to a branch or to a tree trunk in your yard. If you use just one or two loops of twine the larger birds will soon make away with the lump, so it is best to crisscross the pieces several times with stout cord. If you would like to see a little winter circus with birds doing acrobatic stunts, such as standing on their heads, etc., fasten a chunk to the underside of a branch. The chickadees, nuthatches and woodpeckers will put on a show for you when they come to it. In fact, you will see the nuthatch do all kinds of upside-down tricks as he pecks away at the suet to get a square meal.

A few minutes' work some evening will make a simple yet efficient food counter for the home, one to which a number of birds usually can be attracted. One or two boards, two or more pieces of lath or old molding, a few nails and a couple of squares of old mosquito netting are needed to make this simple food shelf. Cut your boards to between 14 and 16 in. long. You will want about a 12-in. width for your shelf. To prevent strong winds from blowing the food away, tack a piece of molding or lath around its edges. Three small holes, covered with netting, in the bottom of the shelf will serve as drains to keep the cafeteria free from water. When completed, fasten the counter to a tree near a window, to a corner of the house, or to one end of a window sill. If possible, locate it on the south side of the house. The shelf can be made more sheltered by nailing a vertical board to one or both ends.

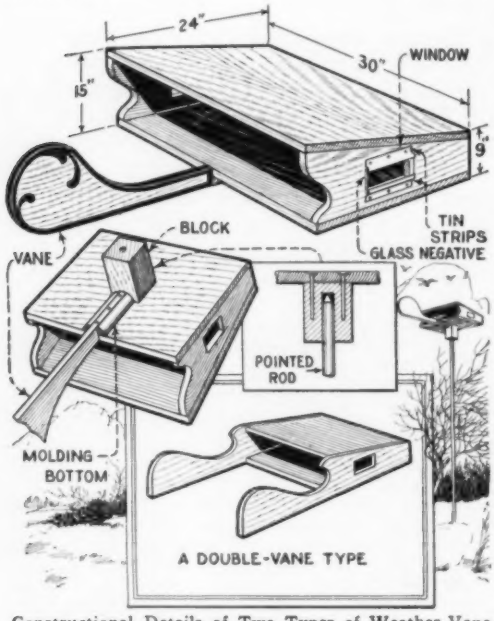
Now you are ready to serve meals and here are some tips on "which foods for which birds." The attraction of suet has already been noted. Stock one side of the shelf with suet and bread or dog-biscuit crumbs. The cardinal, or redbird, likes crumbs. Many of these handsome song-

sters winter in the north and can be attracted to a food counter. The brown creeper, the bluejay, the junco, the mocking bird, chickadee and crow have been known to eat crumbs. Hemp seed, chaff, cracked corn, oats, canary seed, buckwheat, broken nuts, millet seed, puffed wheat or rice, rolled oats (the kind you eat as oatmeal for breakfast), sunflower seeds and fat pork are other foods eagerly eaten by various birds which, in different parts of the country, may choose to stay around all winter.

One of the neatest and most decorative bird cafeterias that you can establish in your yard is made from a coconut. Buy one or more nuts that are dried out (they are not expensive) and proceed as follows: First, cut a small hole in the side of the nut. This may be of any size. If you want large birds to be your boarders cut a hole that will let them get their heads in. If you want to attract only the chickadees and nuthatches make the hole not more than 2½ or 3 in. in diameter. Into the top of the nut put a screweye, attach a piece of wire or stout cord to the eye and suspend the coconut from a limb of a tree in an accessible position, so that you can easily fill the interior with foods

The Window-Shelf Station Provides More Amusement than Any of the Other Feeding Stations, as the Antics of the Birds Are Seen in "Close-Up"

for your bird guests. Chopped suet with peanuts or other food admixture is the bill of fare suggested for this coconut restaurant.



Constructional Details of Two Types of Weather-Vane Feeding Stations

Another way to rig up a coconut is to bore a small hole in one of its ends, wrap wire mesh around it, fasten a piece of stovepipe or other wire to the mesh and then suspend the nut from a branch near the house or from the porch. If possible place your station near a window so that you can watch your feathered guests. The wire mesh around the nut is rather desirable, as it gives the birds a good purchase on the nut when they alight on it.

For large gardens, farmers' orchards or estates, the weather-vane feeding station is a serviceable and very popular type. Any adult or boy handy with a saw and hammer can make one of these. The idea behind the weather-vane feature is to have a feeding place that swings with the wind, thus providing shelter for the birds as well as for the food.

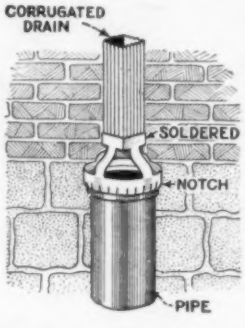
Here is the way to make one of these weather-vane feeding stations so that it will be not only efficient but attractive. Take some ½-in. boards and construct a three-sided box, 24 to 30 in. long, 16 to 24 in. wide and 15 in. high at the open side. Let the top slope back so that it will be only 8 or 9 in. high at the rear of the box. For the floor use a fairly heavy board, as you want to nail a couple of weather vanes to it. In making the vanes you can devise all sorts of artistic designs to obtain an ornamental and attractive effect, but do not make them less than 2 ft. in length. The ends should be 8 to 10 in. wide, to make the whole swing easily in the wind.

The weather-vane station should be set upon a pole reaching 5 to 6 ft. above the ground. At this height the food counter is safe from neighborhood cats. One of the simplest ways to pivot the feeding station is to bore a hole in the center of the bottom of the box and also into the center of the pole. Make this just a trifle larger than the biggest spike that you can buy. Grease the spike, drop it into the hole, and you have a center pivot which will allow the station to swing as the wind blows. Another way is shown in the drawing.

Probably the most attractive and by far the most entertaining method of feeding birds during the winter months is to lure them to a window shelf. It means a three-ring circus for most any winter day, and the home owner can sit in a comfortable chair inside the house and watch the fun. Another advantage of luring winter birds to a window shelf is that crows won't be among those present. The black rascal refuses to get chummy in this manner.

Improving the Rain Spout

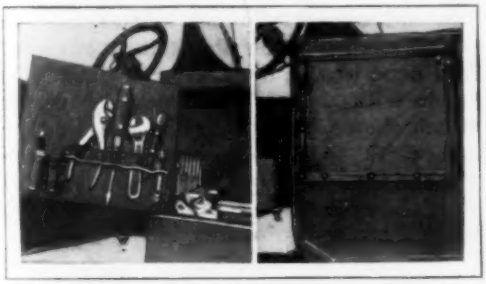
During the winter months perpendicular rain spouts are often weighted with ice and wall anchors are not always strong enough to hold the weight. After a spout had fallen twice in one winter, we hit on the plan shown in the illustration. Usually the spout is cut and swaged at the lower end where it enters the cast-iron or tile soil pipe. This arrangement allows the latter pipe to settle



and draw away from the gutter, throwing all of the weight of the pipe and ice on the wall anchors. To overcome this, we designed a bell flange, or collar, which was soldered to the outside of the spout and then flanged around the bell of the soil pipe. This gives more support and rigidity to the whole structure and thus will prevent further trouble from this cause.—O. S. Sprout, Lancaster, Pa.

Convenient Tool Chest for Auto

Finding it annoying to have to dig under the back seat every time I needed a small wrench, screwdriver or pliers, I put a tool compartment rack on the door of my car. I pulled off the lining of the front door and cut away the upper half of the metal lining. Then I made a little door of three-ply veneer to fit this opening, covered it with a piece of top material and finished it with some binding tape and black-headed upholstery tacks. On the inside of the door I made leather loops for the tire gauge, a pair of pliers, two screwdrivers, a small crescent wrench and a platinum file. In the pocket part of the door I keep a canvas water bucket, a parts catalog, a celluloid glare shield, extra valve cores and some coil points. The covering of the tool door is tacked onto the frame of the car door, thus completely concealing the hinges. There is a little button at the right, near the top, to keep it closed.—H. J. Blacklidge, Tucson, Ariz.



Compartment in Front Door of Auto Makes Tools Easily Accessible

¶Before putting on a tire casing, wipe it carefully with a moist rag to insure that the inner tube will not be damaged by dirt or sand lodged in the casing.

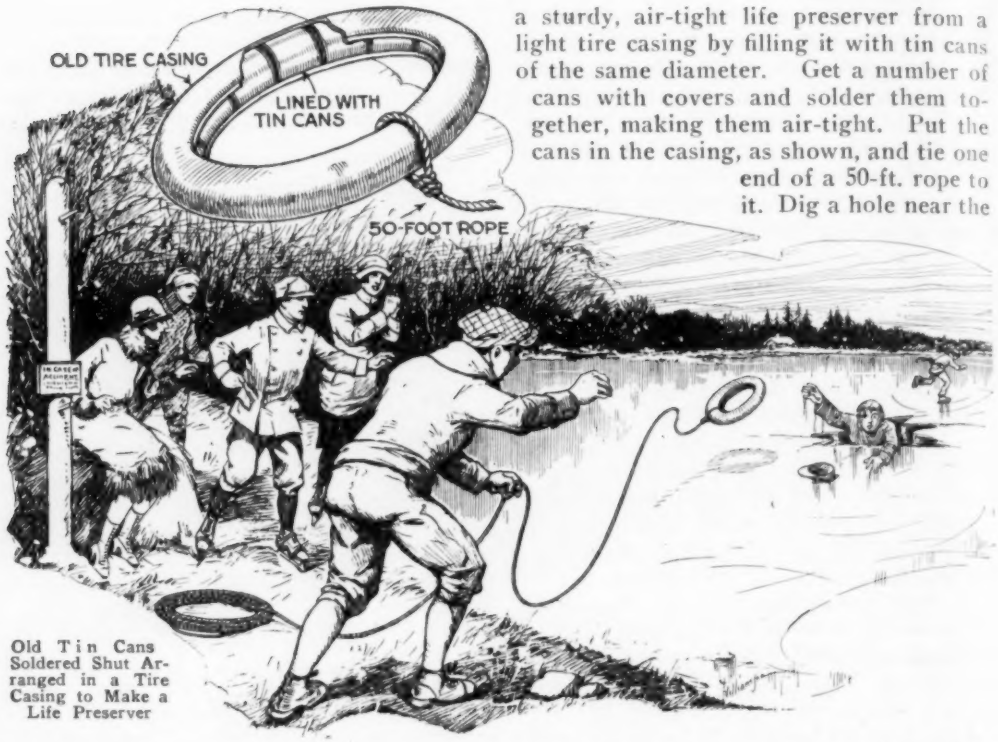
Lads Make Their Own Ice Skates

Santa Claus had failed to furnish skates for these boys, so they decided to make them themselves. They proved their ingenuity by getting some wire barrel hoops, a few pieces of firewood and some string, and from these they fashioned the skates, which proved satisfactory and serviceable. The wood was whittled down to the approximate size of their feet and the front rounded, as shown in the photo. A shallow groove was cut along the edge to receive the wire, which was securely stapled on at the top and back. The wire was filed to a triangular form to prevent the skates from slipping sideways.

Lads Make Their Own Skates from Pieces of Firewood and Lengths of Wire

Testing Contact of Charging Clips

A pocket voltmeter with the terminals marked is useful when charging storage batteries at home with a small portable charger. The voltage is taken on the clips while the charger is going, and if much higher than the usual voltage of the battery, indicates a poor contact of the clips with battery terminals. Cleaning of the clips and terminals will bring down the voltage unless the battery is badly run down, when it may have a high resistance for a time, until the coating is removed from the plates. The voltmeter is also useful to show which terminal is positive if the markings are worn off.—E. T. Gunderson, Jr., Humboldt, Iowa.



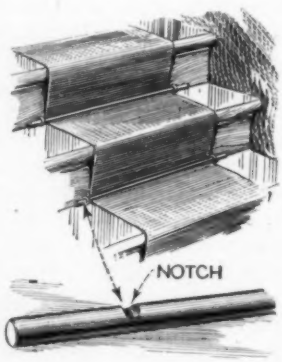
Old Tin Cans Soldered Shut Arranged in a Tire Casing to Make a Life Preserver

Life Preserver for the Skating Pond

Whether you skate on a small pond or a large lake, you should have a life preserver hung upon a post near the edge of the ice in case of accident. You can make a sturdy, air-tight life preserver from a light tire casing by filling it with tin cans of the same diameter. Get a number of cans with covers and solder them together, making them air-tight. Put the cans in the casing, as shown, and tie one end of a 50-ft. rope to it. Dig a hole near the edge of the lake and set up a tall post, with its top well out of the way of curious youngsters. Drive a spike near the top of the post and another one a few feet lower down. Then place the tire over the top nail and coil the rope on the other one.

Non-Slipping Stair-Carpet Rods

If metal rods are used to hold a stair carpet in position it will be found that they have an annoying tendency to slip out of the eyes. This can be prevented by filing a notch in each, as shown in the drawing. If screweyes or clips are used to hold the rods, the latter will be forced against the former by the carpet, the notches registering with the clips, so that the rod cannot slip out sideways. The notch need only be filed out at one side, and need not be deep. It can quickly be made with a flat file. The width of the notch should be about 1/16 in. greater than the width of the screweye. To remove the rod the latter is pressed down until the notch is clear of the screweye.—C. A. Oldroyd, Barrow-in-Furness, Eng.

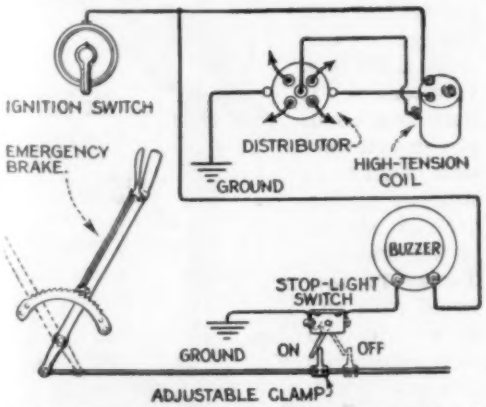


Buzzer Arranged to Prevent Running with Emergency Brakes On

Motorists, especially beginners, sometimes forget to release the emergency brakes when starting and their attention is not called to this fact until they smell burning paint and brake lining. But it is then too late, as the brakes will have to be readjusted or relined, which is expensive in any case, and annoying because of the

delay of having them fixed. A buzzer and switch, in combination with the emergency brake and ignition system, can easily be wired so that, when the emergency brakes are on, the buzzer will give warning as soon as the ignition is turned on, and cease sounding the moment the brakes are released. The materials necessary for this installation are a door buzzer, a stop-light switch and some insulated wire, which can be purchased at any accessory house. Fasten the switch under the car in a suitable position, or according to the directions that accompany it, and arrange the lever or the part that projects from the switch, to connect with the adjustable clamp on the emergency brake rod, as shown, so that when the brakes are on the switch will be thrown in. The buzzer can be fastened anywhere on the dash behind the instrument board. Connect, or ground, one side of the switch to the frame of the car and the other side to the buzzer terminal. Connect the other terminal of the buzzer to the wire that leads from the ignition switch to the high-tension coil, or the terminal on the coil that this wire connects to.

This done, everything should be in working order, and the buzzer will give warning as soon as the ignition switch is turned on, provided the emergency brakes



Buzzer Sounds Warning That Emergency Brake Is On When Starting Car

are on and the stop-light switch has been so adjusted that it is closed.—Francis G. Le Merle, Washington, D. C.

A Toy That Will Please the Children; Whirling Clown Made from a Spool and Some Cigar-Box Wood

Whirling Clown Amuses Children

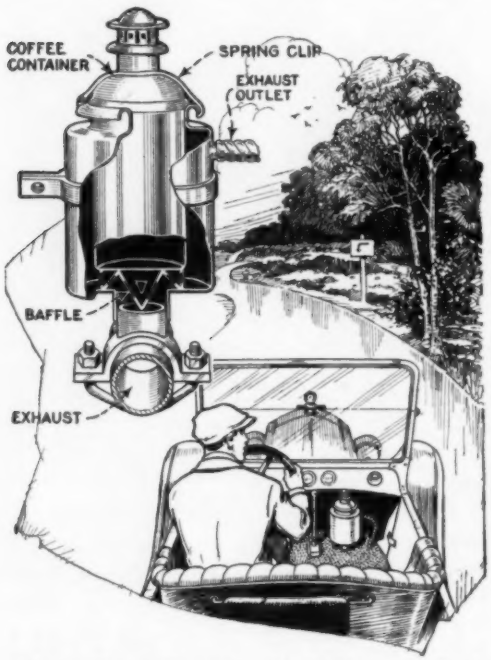
By pulling a string, a small figure of a clown, made of wood, can be whirled back and forth rapidly. A slat, cut from a piece of cigar-box wood, serves as a base and a peg is provided in the center for a spool to rotate on. At one end, a rubber band is fastened by means of a staple or screweye, and a length of cord is attached to the rubber band, looped around the spool and then passed through two staples, as indicated in the drawing. The clown also is cut out of cigar-box wood, painted suitably and attached to the top of the spool. Pulling the cord causes the spool and the clown to turn in one direction and releasing the cord allows the rubber band to contract, making the spool turn in the opposite direction. —E. F. Gustafson, Chicago, Ill.

Retouching Scuffed Places on Furniture

Mix a little color with turpentine to the same shade as the surrounding surface. Dip the end of your finger in shellac and touch the scuffed spot. Then immediately dip your finger in the color and apply it on the shellac. This will dry in a short time and the color will remain. When all the spots have been thus attended to, shellac, varnish or polish in the usual way.—Francis W. Henry, Pottsville, Pa.

Exhaust-Heater Coffee Pot for the Car

Hot, fresh coffee is invigorating on an auto trip so I made an exhaust-heated coffee pot for my car. A hole was cut in the exhaust pipe just ahead of the dash and a regular cut-out, with the valve removed, was attached just above the hole. A tinner made the outside retainer to fit a standard metal jar. The retainer was provided with a neck underneath to fit over the open cut-out, to permit entrance of the exhaust gas. A hole was drilled in the side near the top, a short nipple was soldered over it and a length of flexible, metallic hose was attached to provide an outlet for the exhaust. The top of the retainer was provided with a spring clip to hold the jar securely. Within the retainer, at the bottom, I had a concentric conical member, which served to deaden the effect of the exhaust both as to noise and pressure on the jar. Ports were cut through this piece so that the exhaust gases could readily pass through it and around the jar but not directly against it. The retainer was fastened to the car by means of a strap-iron bracket. Besides making coffee, one can boil eggs and cook soup, etc., in this device. It will prove a boon on long trips, picnics, and the like.—C. C. Hermann, Moline, Ill.



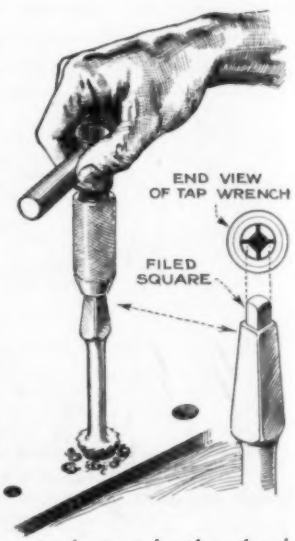
Exhaust Heater Mounted under Dashboard Is Handy for Making Coffee on Long Trips

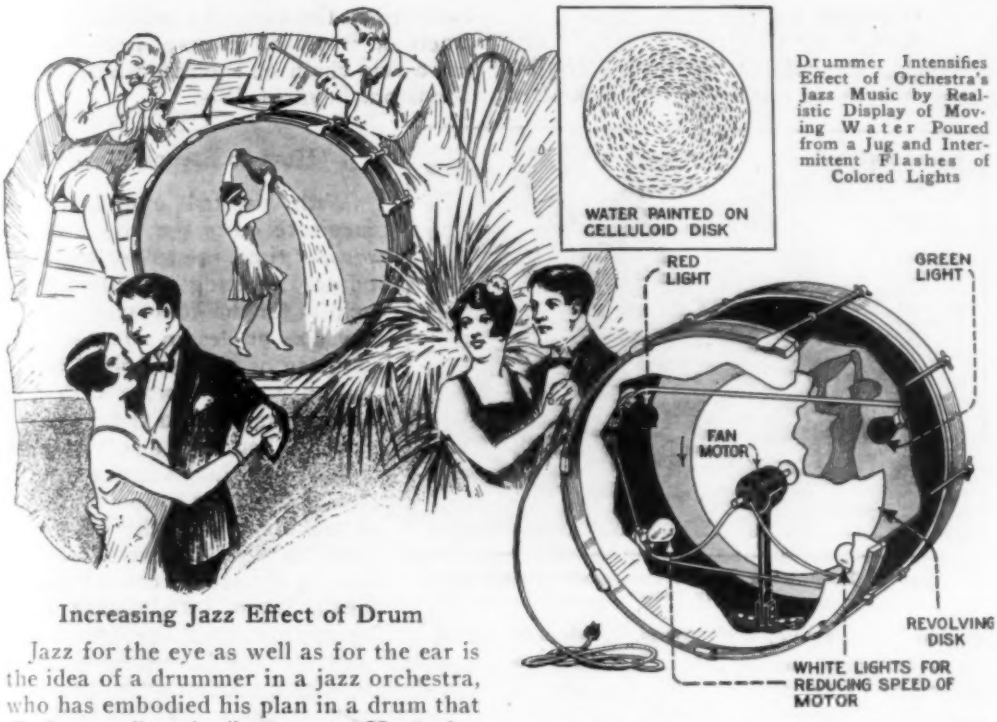
Care of Knives and Forks

Silver knives and forks often have separate handles and pouring hot water over them when washing will cause the handles to loosen on the shanks. This can easily be repaired without going to the expense of taking them to the jeweler or some other party doing this kind of work. Heat the handles carefully without direct contact with fire and remove all the material which the handle holds. Then prepare a mixture consisting of beeswax, ¼ lb.; plaster of paris, ¼ lb., and rosin, 1 lb. Melt these ingredients together and fill the hole in the handles with the mixture. Before the handle cools insert the shank, being careful that it is in alinement so that the job will not have to be done over. The mixture can be put aside and used again, reheating it each time. It is inexpensive and easy to make so that this method offers a convenient and economical means of repairing and keeping the knives and forks in good shape all the time.—L. H. Georger, Buffalo, N. Y.

Tap Wrench Holds Countersink

When drilling holes in wood, it is inconvenient to change often from a bit to a countersink if both are used. If the countersink butt is squared with a file, as shown in the drawing, it may be fastened in a tap wrench, and can then be handled with much more convenience and does not have to be put in the chuck of the brace each time.—Richard C. Tarr, Gloucester, Mass.





Drummer Intensifies Effect of Orchestra's Jazz Music by Realistic Display of Moving Water Poured from a Jug and Intermittent Flashes of Colored Lights

Increasing Jazz Effect of Drum

Jazz for the eye as well as for the ear is the idea of a drummer in a jazz orchestra, who has embodied his plan in a drum that displays a "moving" picture. He had a scene painted on the drumhead to represent a woman pouring water from a vase and, when the device is operating, it seems as if the water actually flowed. The effect was obtained by means of a revolving disk of celluloid, painted as indicated. The disk is driven by means of a fan motor, which is wired in series with two small electric-light bulbs. These serve the double purpose of reducing the speed of the motor and furnishing illumination. Two additional colored lights operated by a small thermostatic sign flasher intensify the effect of motion and color. The motor and disk are supported on a wooden post attached to the shell of the drum by means of two brass angle brackets. A length of flexible cord with a plug attached is connected to the motor, so that it is possible to plug in at any convenient socket. So realistic is the effect of this simple device that, when it was tried out at several fraternity dances, much sport was had in holding punch glasses near the figure in the scene as if getting some of the water.—H. N. Loeb, Cincinnati, Ohio.

Dollar-and-Dime Can Opener

Next time you have to open a can having a friction cover, take a silver dollar and a dime and pry off the cover as shown. The dollar gives enough leverage in the right place and the dime is slipped under the cover to raise it easily. You will save time, patience, a knife blade and also avoid the possibility of cutting yourself.—F. Bentley, Missouri Valley, Iowa.

Method of Opening Can by Using a Dollar and a Dime as a Lever

Runners for the Motorcycle

During the winter months of continuous snow, near Lake Superior, it is often impossible to travel with autos. A doctor must, however, make his calls and as a horse and cutter are too slow, one doctor adapted his motorcycle to the snow-covered roads by the addition of runners, as shown in the photo. The front runner is made from an old wagon tire, 4 in. wide and 36 in. long. A 10-in. section at the front and a 3-in. section at the rear are curved upward. The runner is fastened to a 2-ft. length of 4 by 4-in. wood, gouged out to fit the tire, and the wheel is attached to the runner by means of clamps, shaped to fit around the rim and held in place with bolts. The runner is attached when the tire is partly deflated so that there will be a very tight fit when the tire is pumped up. The sidecar wheel is removed and a runner is provided. It is also made from a 36-in. length of old wagon tire, 2 in. wide, and is supported by a U-brace attached to the axle. In order to provide traction, it is, of course, necessary to use a skid chain on the rear wheel.—J. H. Deniston, Bayfield, Wis.

Provision of Runners on Motorcycle Permits Travel through Heavy Snow

How to Stencil Neatly

With painted and lacquered furniture quite the vogue at the present time, the following method for applying stencils will be helpful for the home worker Cut any size or design suitable from light tag or two-ply bristol board. Fasten it to the work with four 2-oz. tacks to hold the stencil in place. Then, with a soft printers' roller, well inked, go over the stencil, applying pressure enough to make sure that the ink comes into the small corners. In removing the stencil care should be taken, when withdrawing tacks and lifting stencil, that the ink is not touched, and you will have a neat, clean-cut design, without hairy or fuzzy edges. The ink will dry as quickly as ordinary paint. If desired, a light coat of varnish may be applied over the design when dry.

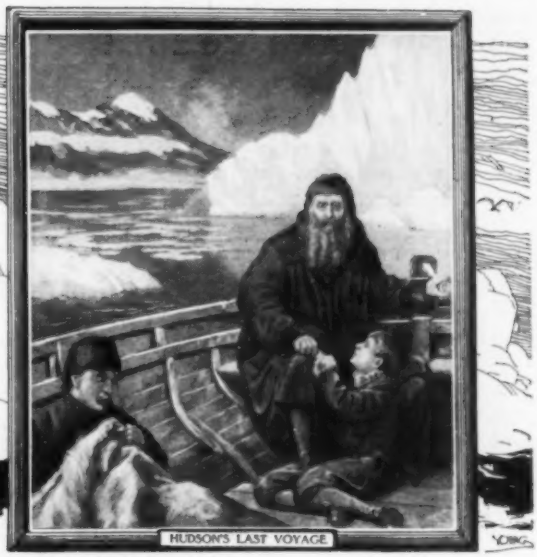
Shield Keeps Auto Engine Warm

It is necessary that your Ford be kept warm on cold days if you are using it. This can be done by obtaining a piece of metal lath of the kind shown in the photo, cutting it to fit over the front of the radiator and attaching it with a couple of stove bolts. This, when painted black, will have the appearance of a winter front that has been purchased at some accessory store and will answer the purpose almost as well. It allows enough air to enter but the engine cannot overheat on a cold day.

Radiator Cover for Cold Weather Can Be Made from Metal Lath

BUILD YOUR OWN SHIP MODEL

by J. Earle Miller



After Painting by John Collier

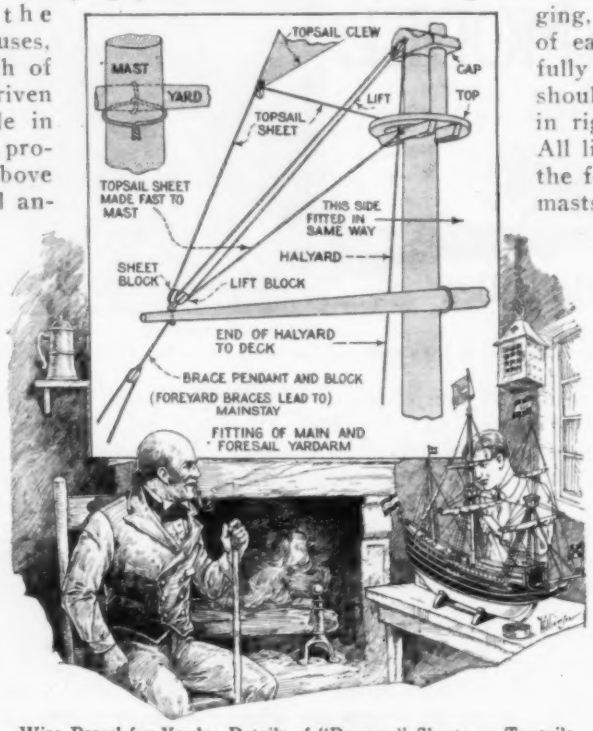
Parts 1, 2, 3 and 4 appeared in the October, November, December, 1926, and January, 1927, issues

YOU are now ready for the job of fitting the running rigging, and for this 84 blocks are required, of the size shown in one of the drawings in the preceding article. They can be obtained from the model-supply house. Department stores sell hard wooden beads, about ⅛ in. in diameter, and these can be made into very effective blocks; they require to be flattened on two sides and trimmed to shape, as shown in the drawings, and this means patient work, but it will save some money. Another way to make them is to get a cheap folding rule, in the ten-cent store, cut it into strips and make the blocks from these. Be sure the rule is made of boxwood. The strapped blocks have a fine wire twisted around them, in the "score" on the sides, some with a hook on top, and some with a hook on top and an eye at the bottom. Examination of the enlarged sketch of the lift block in one of the drawings will make this clear.

The first step is to attach the yards and the lifts, the latter being the tackle by means of which the yards are raised and lowered. The yard is held to the mast by means of a wire "parrel" (shown in the top left-hand corner of illustration on page 322), one ring of the wire embracing the mast and another the yard. The lifts of the main and fore lower yards are fitted in the same manner. Number 60 holes are drilled through the yardarms, just inside the black tips, and an eye, made of fine wire, fastened through the holes, the eye being on top of the yard. Hook a block in the eye, then fasten another block to an eye on the cap of the lower mast and attach the end of a length of button thread to the eye on the bottom of the strap. The button thread may be black, but it is better to use the light-tan thread sold in the ten-cent store, as it is more nearly the color of the actual rope. The end of the thread is now passed through the block on the yardarm, from the bottom to the top, then around the block hooked to the cap of the lower mast, and passed through the lubbers' hole to the deck; the part that leads on to the deck is the halyard, and the main-yard halyard is passed through one of the holes in "Noah," around the windlass and belayed, or made fast, to the bollard. The foreyard halyards are belayed to pins driven through the lower mast about ¾ in. above the deck. Remember that in most of the drawings only the rigging on one side of the yards is shown, and that the other side is rigged in exactly the same manner. The rigging on the model, while following very closely the original, has been simplified to a certain extent, as it is almost an endless task to build a model of this size exactly to scale in every respect.

The lifts and halyards for the fore and maintopsail yards are fitted in the same way, but the lift for the lateen yard on the mizzen is single, and attached at the center of the yard, the upper block being hooked into the end of a short length of thread—a pendant—fastened just under the mizzen top, and the halyard belayed at the starboard pin rail.

Very neat brass belaying pins can be obtained from the model-supply houses, but a short length of an ordinary pin, driven through the hole in the pin rail and projecting ¼ in. above and below it, will answer just as well. The ends of the lines should be belayed to these in the form of a figure eight, not simply wound around them; a drop of shellac keeps them from coming free. Owing to the difficulty of getting the hands among the rigging, all lines should be cut about 1 ft. longer than necessary. Take an 8-in. length of ⅛-in. wire, grind the ends down to about 1/32 in. for a distance of 1 or 2 in., and then form a small eye on one end and a hook on the other. By threading the end of the thread through the eye, then holding the end in one hand, so as to keep it taut, and the wire in the other, it is possible, working from the opposite side of the model, to belay the ends without difficulty.



Wire Parrel for Yards; Details of "Dummy" Sheets on Topsails, and Lifts and Halyards of Main and Foreyards

The lateen yard hangs at an angle of 45° to the yard, and is fitted with a peak halyard at the upper (the left or port) yardarm. This is attached by means of a crowfoot, as shown, and a euphroe can be used instead of a block for the latter. This fitting simply consists of a thin sliver of boxwood, drilled for the crowfoot threads and the end of the halyard. The other end of the halyard runs through a block under the maintopmast cap, then down to a block about 2 in. away from the mast. From an eye on the starboard side of the quarterdeck rail, a length of thread runs around this block, and then back to the quarterdeck pin rail, where it is made fast.

The drawings show all details of the rigging, and if the lead of each rope is carefully studied, there should be no trouble in rigging the model. All lines leading from the fore and maintopmasts straight down to the deck go through the lubbers' holes in the tops. Do not set up any of the lines on one side too taut until the corresponding line on the other side has been rigged, otherwise the trim of the yards will suffer. The spritsail yard, on the bowsprit, is parreled to the latter in the same manner as the other yards are attached to the masts, but the lifts, on this yard, become "outhauls." The cargo whips, shown in one of the drawings, need little description. They are attached by means of pendants to a heavy thread stretched from main to foremast, under the tops.

The braces are the tackle by means of which the yards are swung from side to side, and these are fitted next. The braces on the spritsail are rigged as shown in the bow view, the standing end (the end made fast) being attached to the forestay, 3 in. up from the bowsprit. The other end goes down around a block on the yardarm, up through another block on the forestay, just above the standing end.

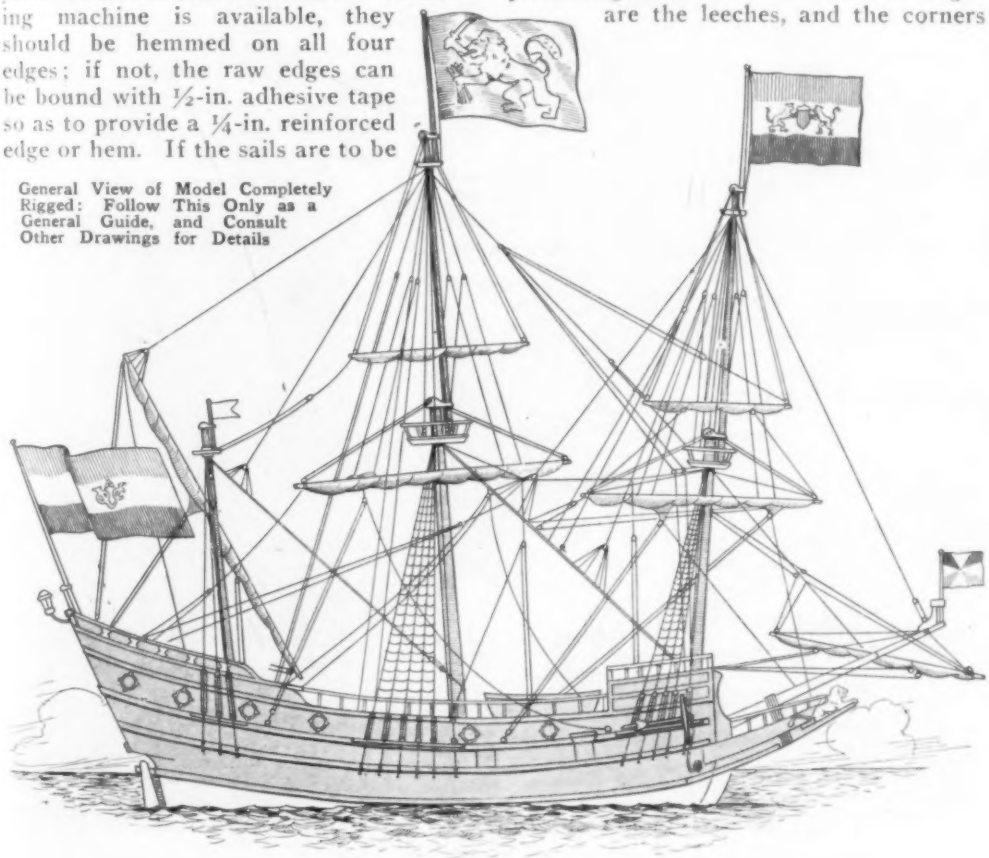
through a block under the top and down to the pin rail. Both sides are rigged alike.

The foreyard braces are led straight back to the mainstay, and the foretopsail-yard braces to the maintopmast stay. The latter run up to a point on the stay 3½ in. from the upper end. The main braces run back to blocks hooked to eyes on the quarterdeck bulwark rail, and the maintopsail braces to blocks hooked under the mizzen top. Remember there is a brace on each side of the yard. The lateen-yard braces are clearly shown.

The sails and their lines come next in order. On this model the sails are furled, but, of course, the reader can have them spread if he desires. The material used is unbleached muslin, which is of a light-tan color. Do not use white. In order to make a neat job of furling, the sails were cut the full width, but only half the "drop" or height. All the sails are cut so that they will be 1 in. shorter than the yard when hemmed or bound. If a sewing machine is available, they should be hemmed on all four edges; if not, the raw edges can be bound with ½-in. adhesive tape so as to provide a ¼-in. reinforced edge or hem. If the sails are to be furled, the drop of the main and foresails is 3½ in.; that of the maintopsail, foretopsail and spritsail 2½ in., and the triangular lateen sail measures 9½ in. along the yard, 7½ in. along the foot and 3½ in. along the leech, or short side. The foot, with the yard at 45°, is parallel to the deck plane.

If the sails are to be set, the mainsail should be 6 in. in the drop, the maintopsail 6 in., the foresail 4½ in., foretopsail 5 in., spritsail 3 in., and the lateen sail 6 in. When the sails are set, the yards are attached as high on their respective masts as they will go, hoisted up, in other words, and the spritsail yard is hauled out on the bowsprit. When furled sails are used, the yards are dropped down to about the points shown on the assembly drawing and, of course, the spritsail yard also is hauled in.

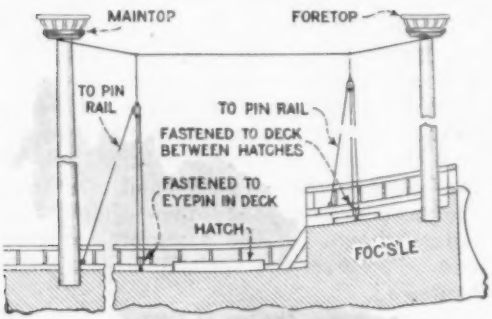
On the sails, the edge that is attached to the yard is called the head and the opposite edge the foot. The two side edges are the leeches, and the corners



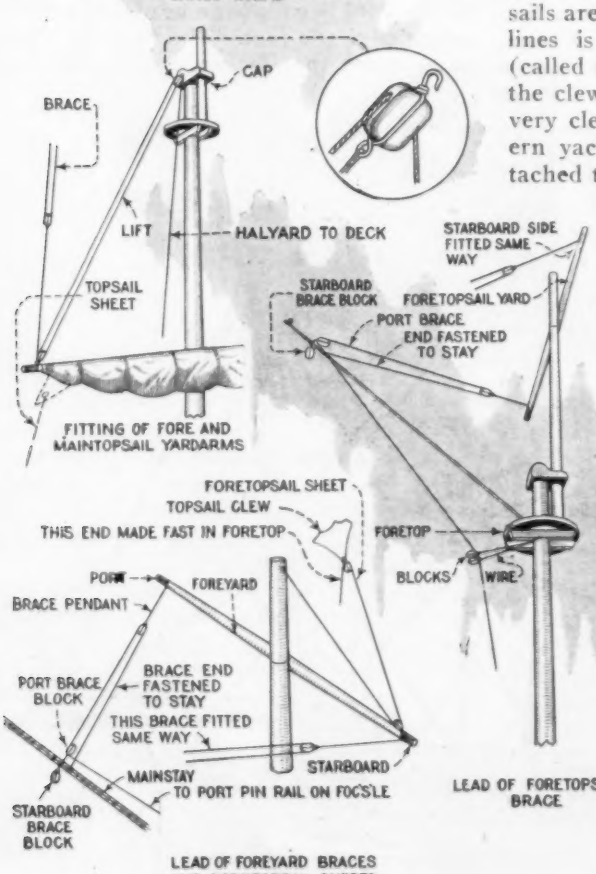
General View of Model Completely Rigged: Follow This Only as a General Guide, and Consult Other Drawings for Details

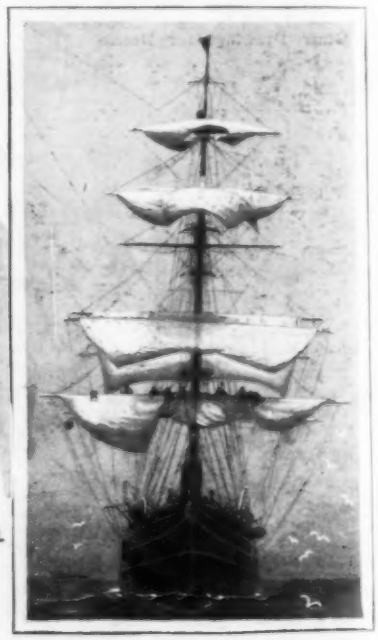
of the sail the clews. The middle of the sail is the bunt. The sheets are not the sails, but the tackle attached to the lower clews of the sails for handling them and holding them fast against the pressure of the wind. The sheet blocks are fastened by means of fine wire to the lower clews of the sails. The port main sheet runs from the eye in the strap of the sheet block around a block wired to the after boomkin, then around the sheet block again and down to the main pin rail. The port side is rigged the same way. There is also a single line (the tack) leading from each clew of the mainsail down through a hole in the forward boomkin and back to the rail. The foresheets are rigged to the middle boomkin, then to the forecastle rail; the port foretack runs down under the beak and up to the starboard forecastle pinrail, and the starboard foretack in the reverse way. The lateen sail, having but one lower clew, has only one sheet. The topsail sheets are more or less dummies, and their rigging is shown on page 322. The yard in this drawing is shown dropped, of course; if the sails are set it will be hauled closer up under the top.

Looking at the view showing the after side of one of the courses, as the lower sails are called, the purpose of the various lines is as follows: The clew garnets (called clewlines on the upper sails) haul the clews up to the yard. This is shown very clearly in the illustration of a modern yacht below. The buntlines are attached to the after side of the foot of the sail then pass under the foot, up



CARGO WHIPS



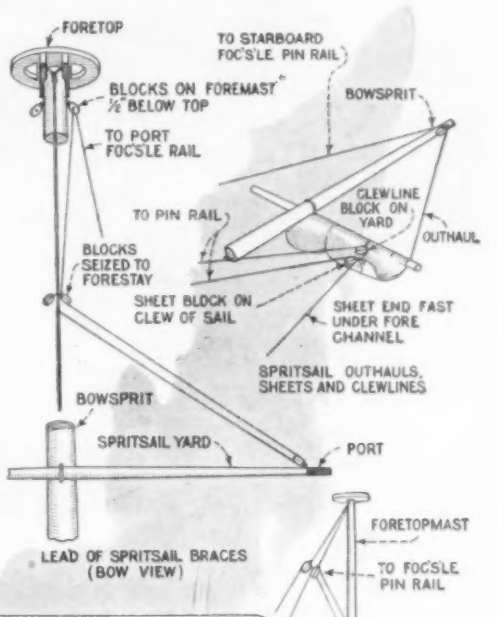


Right, Modern Yacht "Aloha," Showing How Sails Are Clewed Up Ready for Furling

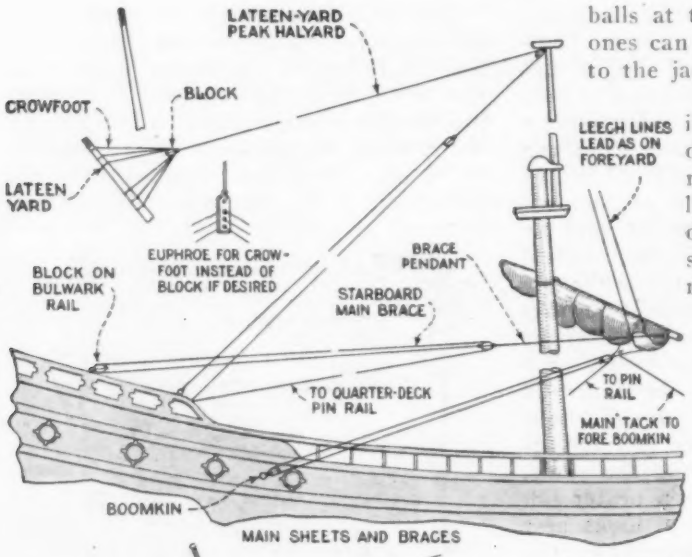
to blocks on the forward side, as shown, and down to the deck; they are for hauling the body or the bunt of the sail upward and forward for convenience in furling and stowing. The leech lines serve a similar purpose. While these lines can be dispensed with, they add considerably to the realism and appearance of the model. The sail is attached to the yard by wire rings passing through the head of the sail and around the yard; while not exactly correct, this is sufficient for our purpose. On the original model, after the sails were attached and furled, they were given a light coat of orange shellac to add to the antique appearance of the whole. If the reader desires, he can furl and attach the sails before slinging the yards, and probably he can make a neater job in this way. The furled sail looks best when full at the center, tapering to the yardarms and well up on the yard.

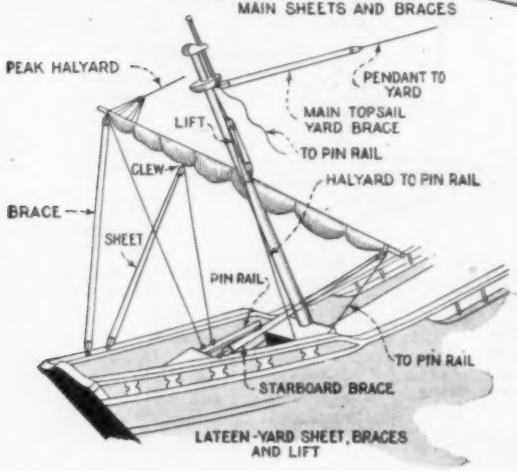
About the only practical way to "belly" the sails, if they are made to be set, is to sew soft copper or iron wire in the hems, and bend the wires to keep the belly in the sail, also giving the latter a coat of shellac. It is well, too, to draw parallel lines with a soft black pencil vertically on the sails, about ⅝ in. apart, to mark the cloths making up the sail.

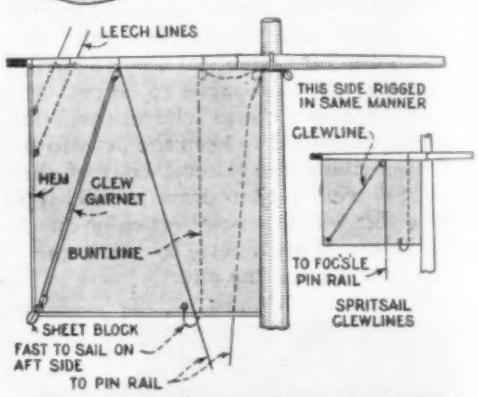
The dimensions of the various flags are as follows: The flag at the main, which was the banner of the Dutch States General, is 4½ by 2⅞ in.; the fore flag, which was the flag of Amsterdam, is 3 by 2¼ in.; the mizzen, the pennant of the city, ½ by ⅞ in. with a ¼-in. swallow tail; the stern staff, the flag of the East India Com-



How the Wire Tool Is Used for Belaying the Running Rigging; Note Wire Pendants for Leech Line Blocks



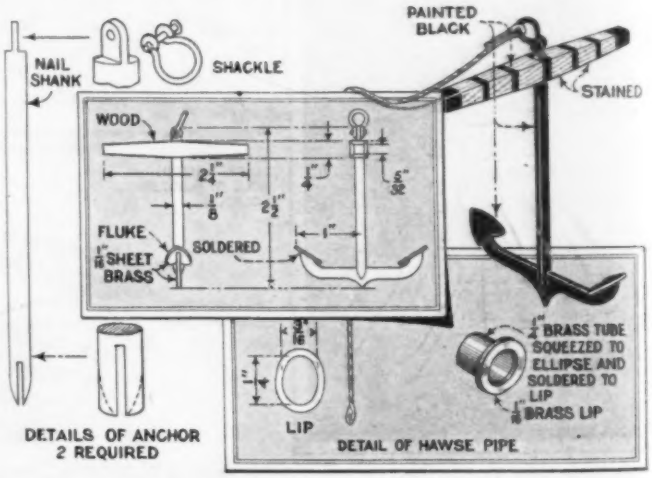



LEECH LINES
THIS SIDE RIGGED IN SAME MANNER
CLEWLINE
HEM
CLEW GARNET
BUNTLINE
TO FO'SLE PIN RAIL
SPRITSAIL CLEWLINES
SHEET BLOCK
FAST TO SAIL ON AFT SIDE
TO PIN RAIL
AFTER SIDE OF COURSE (LOWER SAIL) SHOWING CLEW GARNETS, BUNT AND LEECH LINES; RIG TOPSAILS AND LATEEN IN SAME MANNER

The Lower View Shows How to Construct Very Simple but Effective Built-Up Anchors

pany (Ost Indische Cie Van Amsterdam), 4½ by 2⅞ in., and the flag on the bowsprit, which was a "prinzen gosch" of the States General, 1½ by 1⅛ in. A key to the colors is given in the drawing of the flags. They are made of unbleached muslin, given a coat of shellac, to stiffen them and to prevent the paint from running. The flags on main, fore and the stern staff are hoisted on halyards that run through holes drilled in the balls at the masthead; the smaller ones can be attached with fine wire to the jackstaffs.

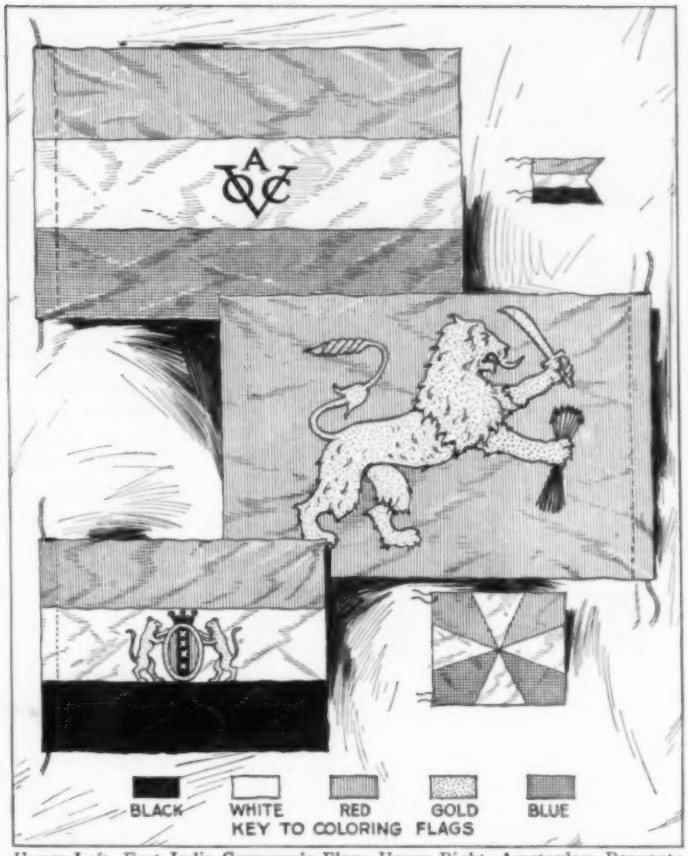
The last job is the making of the anchors, and full details for this and the making of the hawse-pipe lips are given in one of the drawings. The anchors are stowed on the fore channels and lashed to the shrouds. Do not use chain for the anchor cables, as chain was not in use at the period of the "Half Moon"; use heavy cord that looks as much like rope as possible. Now go over the model and retouch all



necessary parts with paint, including the touching up with flat black paint of all pinheads and wire fittings, and your model will be completed.

One final word. You have been instructed previously to use automobile paints ground in japan for the model. Now, the color scheme used on the original model may be modified or changed in any way that appeals to the maker, but you should stick to the flat paint specified, and, on no account, use a shiny paint or enamel anywhere. After several coats of the flat paint have been applied, and have dried, if the paint is rubbed briskly with a clean soft rag, it will acquire a soft polish that makes the hull look as if the surface had been worn by handling for years; in other words, it gives a sort of artificial "patina," that antique collectors talk about. As the cloth polishes only the high spots, and the corners of the strake joints, etc., remain flat, the effect of age is heightened. If the color scheme is changed, keep the new colors as subdued as possible, consistent with good decorative effect, since glaring, new-looking colors on a model of this type are entirely out of place. You do not want to make a fake antique, of course, but neither do you want a model of a vessel of this period to look like a cheap factory-made toy. A number of ways to "age" the model will occur to the builder, such as smudging the brighter colors with darker paint, but do not overdo these things, or it may easily happen that you will spoil the very effect you are trying to achieve.

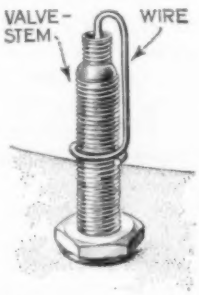
Owing to limitations of space, there may be some details that we have not made quite clear to the reader. In case of any doubt or difficulty, simply drop a line to Amateur Mechanics department, and we shall be very glad to serve you with advice and help in every possible way.



Upper Left, East India Company's Flag; Upper Right, Amsterdam Pennant; Center, Flag of States General; Lower Left, Flag of Amsterdam; Lower Right, "Prinzen Gosch" of States General

Holding Tire Valves Open

It usually takes some time to let the air out of a tire, but the simple tool shown in the illustration, which holds the tire valve open, allows the air to escape and frees the motorist's hands to do other work. The tool is a short piece of wire with a hook bent at one end, to hold the valve open, and a loop on the other end, to catch the threads of the valve stem.—E. A. Goering, Langenburg, Sask., Can.



Running Lampcord through Metal Molding

Lampcord on the floor is broken and worn out rather easily and always collects dirt besides being a fire risk. To overcome these troubles, the installation

Lampcord Protected from Injury by Installing It in Metal Molding Screwed to Baseboard

shown in the drawing will be found practical. Metal molding of the kind used by electricians for concealing wires run over walls and ceilings is obtained, and an elbow fitting if a corner has to be passed. The molding comes in any color and shade desired to match woodwork. Run it along the baseboard and screw it in place, as indicated. The lampcord is inserted in the molding and the cover snapped on so that one can only see the plug and the socket end of the lampcord.

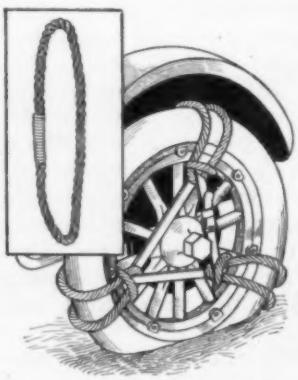
Dark-Room Light "Pirates"

Recently I made some experiments to find out what damage was done by light "pirates" in the photographic dark room. My pirates consisted of a red light, a lighted cigaret, the rays from a luminous-dial wrist watch and the flash from an electric switch. For ordinary work these lights do no serious damage, but for the particular operator handling ordinary work, and for all work of precision, it is wise to guard against them. No so-called safety light is absolutely safe. The rays from any red light register upon a film, but it is rather a matter of how much exposure the film can stand without doing any serious damage. A red light, which I had always considered safe with portrait film, showed considerable registration upon a piece of dry film exposed for one minute at a distance of 3 in. Such long exposure to a dry film is seldom necessary, and it is true that a wet film is less sensitive, but this exaggerated result showed that some registration would take effect upon wet film while exposed to the red light for examination in the process of development.

There are a few photographers of my acquaintance who persist in smoking cigarets in the dark room. This is unsafe even in the most adverse working conditions. Cigaret light is white, and three puffs of a cigaret held 6 in. away from a piece of dry film resulted in considerable fogging and was sufficient to ruin the film. A 30-second exposure of a piece of portrait film to the luminous dial of a small wrist watch resulted in the complete breaking down of the silver deposit. One minute's exposure at a distance of 4 in. made a noticeable registration. A flash from an electric switch registered enough to ruin a film. Although this exposure was for a fraction of a second, the flash contained rays, to which portrait film is very sensitive.—Edward H. Flaharty, Parco, Wyo.

Emergency Tire Chain

Many motorists do not have chains, and during the summer months it sometimes happens that they are caught on soft ground or mud unexpectedly. It is better to be prepared for such emergencies by carrying along six endless ropes and two strong leather straps. When you get on soft ground where you cannot make any headway, slip the ropes over the wheels as shown in the drawing, holding them in place with the straps.

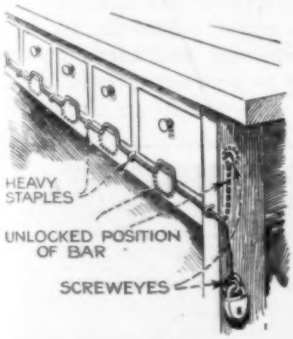


Rubber Band Replaces Book End

When books do not completely fill a shelf or are placed elsewhere without any support for the end ones, a strong rubber band will be found an efficient substitute for book ends. The band is slipped around the last two or three books and placed so as to coincide with the framing lines of the title so that it will not be conspicuous. Books held together in this way will stand quite firmly, preventing those next to them from falling, and a rubber band is likelier to be at hand than an extra book end.—Harold E. Benson, Denver, Colorado.

Several Drawers Locked with One Bolt

To eliminate the necessity of individual locks for the several tool drawers in his workshop, a garage owner made use of the illustrated attachment, which locks or releases all the drawers from one point at the end of the bench. A length of ½-in. round steel rod was shaped in the manner shown and attached to the bench just below the drawers by means of heavy staples, which were clinched on the inside. The rod was bent at a right angle at one end of the bench and formed into an eye large enough to pass over a screweye to which a padlock is attached, as shown. Another screweye is fastened to the bench above the bar. The operation is obvious.



Making Gold Leaf Adhere Permanently

To make gold leaf adhere permanently to any surface, try the following: Put some isinglass in a little water and heat slowly without allowing it to boil. Add as much nitric acid as isinglass. Allow the mixture to cool and apply carefully with a brush. This mixture not only makes a permanent job of the work, but will not be absorbed by the paper pages of any book on which it may be used.

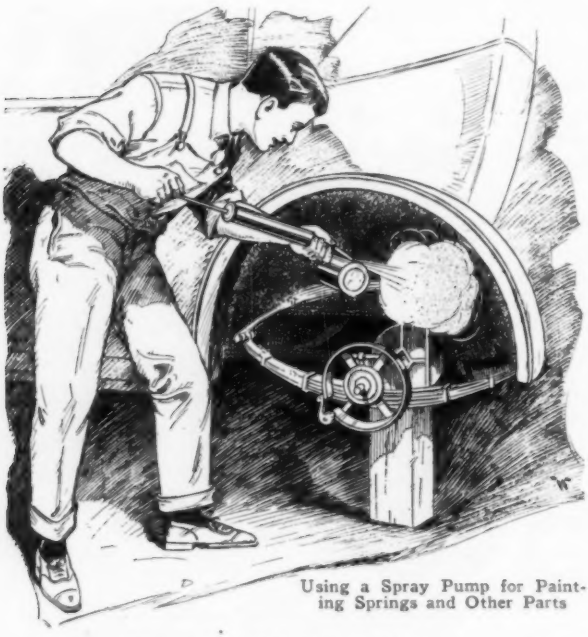
Paper Pulp Pressed into Small "Logs" Makes Economical Fuel

Paper Pulp Makes Good Fuel

I have been making paper fuel of the kind shown for a number of years from scrap paper that accumulates around the house. Each year I make enough to last the whole winter, burning it in an open grate. The paper is soaked to form a pulp and is then pressed into shape using molds made of 4-in. iron soil pipe, 12 in. long and sawed lengthwise. It is then allowed to dry out thoroughly. This makes good fuel, which gives plenty of heat, is economical and serves well also as kindling for starting a coal fire.—John E. Mason, Hamilton, Ont.

Setting Mousetraps

The danger of setting mousetraps can be eliminated by using the method shown in the illustration. A ¾-in. hole is drilled through the wood base of the trap just under the end of the bait pan. By inserting the finger in the hole from the underside of the trap and lifting the pan to the position indicated, so that it engages with the catch holding the spring, you are fully safeguarded against any chance of injury to your fingers.



Using a Spray Pump for Painting Springs and Other Parts

Spray Pump for Painting Springs

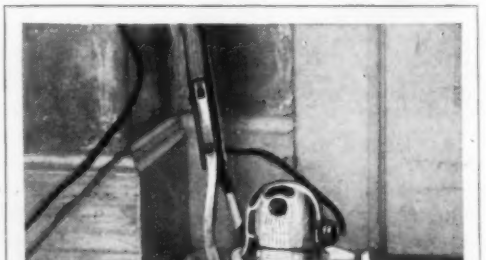
Usually a good brush is used for painting the body and fenders of a car, as these surfaces are smooth and can be thoroughly cleaned before applying the paint. However, it is quite a difficult matter to clean the springs and other parts under the car and by painting them with a brush one always picks up dirt out of the cracks and corners, which covers the brush and spoils the painted surface. By doing the painting with a spray pump, as shown in the drawing, this trouble is avoided. If ordinary rust-proof paint is used no thinner is necessary, but auto enamel should be diluted with about ten per cent of turpentine. The spray enters the cracks and crevices, and places which are inaccessible with a brush.

Soot for Furnace Covering

When cleaning out some large flue pipes at a power plant where a lot of wood, sawdust, etc., was burned in the boiler furnaces, a large quantity of soot had to be removed. As an experiment I made a thick mixture of this soot with water, then used equal parts of the soot mixture and ordinary asbestos cement to cover a heater, using the ordinary form of wire netting as a holder for the compound. When the soot-asbestos covering dried out, not only had it fewer cracks than the asbestos coverings on other heaters, but the soot-asbestos surface also was cooler than the all-asbestos, which meant an appreciable saving in boiler efficiency.—J. E. Noble, Toronto, Can.

Vacuum Cleaner Helps Heat Second Floor

In old furnace installations the pipes often lead only to the first-floor rooms and the upper rooms are provided with floor registers extending through to the ceiling of the room below. The upper rooms get their heat in a very slow and indirect fashion in this way, and if these rooms have to be heated quickly, some auxiliary apparatus is almost necessary. One housewife overcomes the difficulty in a simple manner. When an upper room is to be heated she simply takes the dust bag out of the vacuum cleaner, places the sweeper over the open register and turns on the current. Acting as a power circulator the sweeper draws the warm air from the room below and shoots it out into the cold upper room. It does it so fast and effectively that only a few minutes are required to make a large room comfortable.



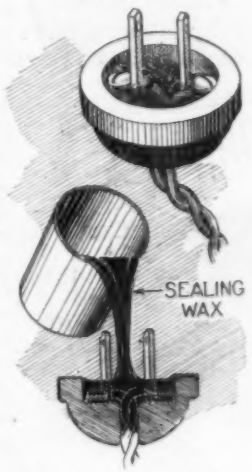
Using a Vacuum Cleaner on Second-Floor Register to Draw Heat into Upper Rooms

Substitute for Child's Bow

An easily made substitute for a bow, which is especially desirable for children interested in archery, can be made from a discarded automobile inner tube. A strip, about ½ in. wide, is cut across the tube, making a large rubber band. The arrows, which should be about 16 in. long, can be made from reeds or cat-tail rushes, by driving a shingle nail into the thick ends and wrapping them with adhesive tape. The arrows need not be feathered. To shoot them, slip the band over the thumb and first finger of the left hand. Then place the arrow in the band, grasping it through the rubber with the thumb and finger of the other hand. Stretch the band to its limit, then release it, and the arrow will be driven out of sight if aimed into the air. The thumb and finger serve as a crotch, while the band serves both as bow and string. Arrows may be shot with great accuracy as it is comparatively easy to aim. In shooting with the band, as with the bow, the arrow should be pulled back in line with the eyes. Children in our neighborhood are able to shoot nearly 200 ft., although 25 to 50 ft. is better for target practice.—C. Bernard Petersen, Minneapolis, Minn.

Sealing Extension-Cord Plug

One of the most common causes of short circuits in extension cords is the loosening of the bared ends from the screws in the plug, which in turn is caused by strain on the cord. A knot is usually tied in the cord by electricians to take the strain, but the method shown in the drawing is an additional safeguard. Melt some sealing wax and after fastening the bared ends tightly, pour in the wax until it is level with the outside edge.—Adolph F. Lonk, Chicago, Ill.



Novel Outdoor Runner for Ice Sport Can Be Made from an Old Skate

An Ice "Kickmobile"

Boys will find the "kickmobile" shown here quite different from ordinary outdoor winter devices. Fig. 1 is the footrest, about 20 in. long and 6 in. wide. It is made of 1-in. wood and an ice skate is securely screwed to it, as indicated. A steering post, with a crossbar attached to the top, is also provided, which completes the runner. The steering post can be made from a piece of willow branch or a strong broom handle, set snugly in a hole drilled in the center of the base, toward the front.

Vulcanizing Small Holes in Auto Tops

When a tear occurs in the top of an automobile, it is usually patched by the cement method or else the hole is stitched like the hole in a stocking. A better method of repair is to vulcanize the top. Fill the opening carefully with the heavy rubber mastic or tire dough used in filling small holes in casings. Then heat two flatirons and press them against the rubber from each side, being careful not to have the iron so hot as to scorch the fabric. In three or four minutes the rubber will be vulcanized.—L. B. Robbins, Harwich, Massachusetts.

Tin Cup Used as a Level

On a camping trip, I had occasion to make a table and seat. As there was nothing horizontal or vertical to use to plumb things up, I took a tin cup and filled it to within ⅛ in. of the brim and found that it made a very serviceable level. Table and seats came out perfectly true. —Albert L. Ball, Niagara Falls, N. Y.

Tin Cup Filled with Water Makes a Serviceable Level for Campers in Making Furniture and for Other Purposes

Tape on Child's Legging

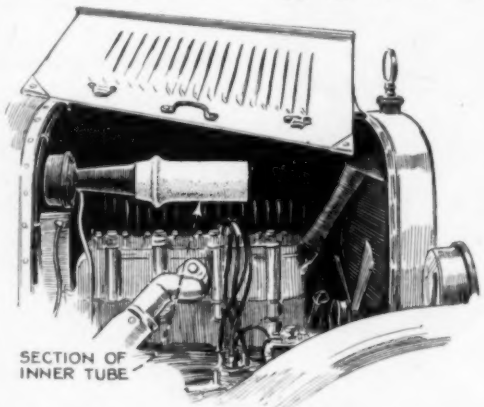
It is possible that many a young mother does not know a good method of keeping her child's legging elastic in condition, as it soon wears out under the child's foot. An easy and permanent method of mending is to buy a roll of electric tape from the 10-cent store and cover the elastic of each legging in the following way: Begin by unrolling several inches of the tape, then start at the point where the elastic is joined to the legging at the side and lay the end of the tape across the elastic in such a manner that the adhesive side will be sticking to the elastic. Continue to wind the tape around the elastic, several turns, by bringing the tape through the opening where the child's foot goes, and at the same time taking care to overlap the edge of the tape at each turn. In this way you will cover the entire elastic and terminate the winding at the end opposite that at which you started. You will find such a covering will enable the child to play about in wet weather, during winter, as the electric tape is not only waterproof but very tough and durable.—J. R. Clough, Washington, D. C.

Lighting a Fire in a New Fireplace

New fireplaces are likely to smoke badly when a fire is first built in them, due to the dampness of the flue. This is also true of a fireplace that has been unused for a considerable length of time. To overcome this smoking is a simple matter. Open any dampers and hold a lighted newspaper high up under the arch and at the beginning of the throat. One or two such applications of heat will absorb the moisture from the surface of the flue bricks and the fire can then be built with little danger of smoking.

Changing Tone of Auto Horn

By taking a piece of old inner tube and slipping the end over the horn, as shown, a new tone can be obtained. A loud horn can be made to produce a soft tone resembling the moo of a cow. Horns having an armature give the best results. The piece of inner tube should be about 1 ft. long, and small pieces are cut off until the desired tone is obtained.—Carlton Groat, The Dalles, Oreg.



Section of Inner Tube Slipped over Auto Horn Changes Its Tone Agreeably

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What You Should Know About Locks

By A. C. LESCARBOURA

SO long as we have locks, the home owner must know something about these seemingly intricate, yet really simple, devices. It may be that he wishes to repair a lock. Again, he may wish to make a key, or to change the lock so as to render the issued keys useless. In any event, a little knowledge about locks will save a lot of time and trouble.

To begin with, there are three general types of locks to be found in the average home. The door locks are usually of the ordinary mortise type, with the lock proper let into a slot cut in the edge of the door. Fig. 1 shows the mortise type of lock being removed for examination and repairs. The rim type, on the other hand, merely screws on one side of the door—the inside, of course. The internal details of both mortise and rim types are about the same, so that Fig. 2, showing the inside of the rim-type lock, actually covers both cases.

The operation of the usual door lock is simple enough. The key is inserted in the keyhole, and the turning motion causes the bolt to be thrown back. However, by studying the details of Fig. 2, it will be noted that there is a barrier, B, which prevents the key from turning unless the tongue of the key is cut with slots to clear the barrier. Sometimes there is also a nib on the lock plate, and it is in order to clear these barriers that ordinary keys are slotted and grooved in characteristic fashion. Additional keys may be made by following the profiling of an

Details of Common Rim and Mortise Locks; Also Interior View of Front-Door Lock with Split Handle and Locking Pins

existing key, or taking the lock apart and studying the barriers so as to file the key to pass them.

Because of the relative ease with which the ordinary lock may be picked, the lock mechanism is generally more elaborate for the front door, as shown in Fig. 3. Here is a combination latch-and-bolt lock, consisting of a spring latch, operated by the door knobs or by a key, and a bolt lock for the lower portion, also operated by a key. The latch is the portion ordinarily employed during the day, but the bolt is used at night. The latch may be opened by turning the inside or the outside knob, provided the buttons or small lever on the edge of the lock are not thrown so as to lock the cam which is moved by the outside knob. The inside has its own cam which is always free to turn. Should the outside knob cam be locked, then a key must be used to throw back the latch independent of the cam. The cam C is the one connected with the outside knob. In this view it is shown locked by the push buttons.

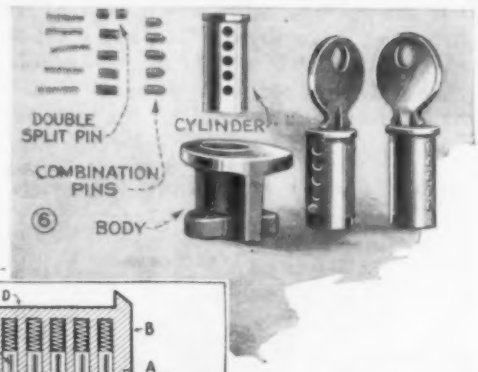
Keys are cut for the foregoing lock in much the same way as for the simple door lock, except that there must be notches cut on the end and side of the key, since the key must not only clear a barrier, indicated by E in this view, but also lift a "tumbler" to permit throwing back the latch or the bolt, as the case may be. The tumblers are shown at A and B, and in detail in the sketch. The key must have a slot on its face, cut to exact depth, to lift the tumbler just high enough but not too high, so as to let the latch or bolt nib or projection slip through. Such a lock is necessarily more complicated and therefore more difficult to pick. Ordinarily, just one lock, the upper lock or latch, is for day use in this combination. The lower lock or bolt is used only at night, and is then locked from the inside with the key.

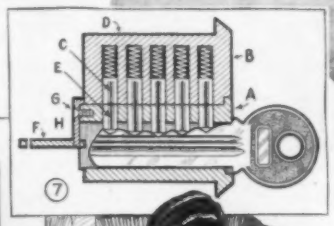
It may be desired to reverse the way in which the door is to close, or, when the lock is purchased, the bevel or slant of the latch tongue may be wrong. This may be reversed by pulling the tongue back clear of its slot, and then reversing it. The cams shown at C must also be turned around, as the manner in which this lock works is to have one of the cams lock with the buttons or small lever on the edge of the lock, so that the outside knob cannot throw back the latch and a key must be used, while the inside knob is always ready to throw back the cam that is always free, so that a key is unnecessary to unlock the latch from the inside. The shaft that passes through the lock from one knob to the other is split, and each half engages with one of the cams. The portion of the shaft with the pins goes to the outside, so that the knob cannot be removed from that side and the shaft then pushed through the door so as to operate the free cam and unlock the door without a key.

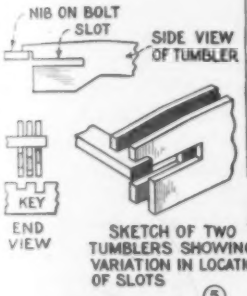
Inside the home, there are various cabinet locks having internal details quite similar to those shown in Figs. 4 and 5. Here is a lock having a number of tumblers, all of which must be lifted a certain distance by the notches in the key before the bolt is presented with a straight or alined slot in the tumblers through which the nib on the bolt may slip back. This is a complicated lock to file a key for. The best plan is to remove the tumblers and proceed to file the key so that its notches raise the tumblers, one at a time, to the point where the slot is in perfect alinement. Care must be taken to get the tumblers back in their proper order, otherwise the combination will be changed. However, if it is desired to change the combination of the lock so as to render outstanding keys useless, the tumblers of any lock having two or more tumblers may be rearranged and a new key fitted to the revised combination.

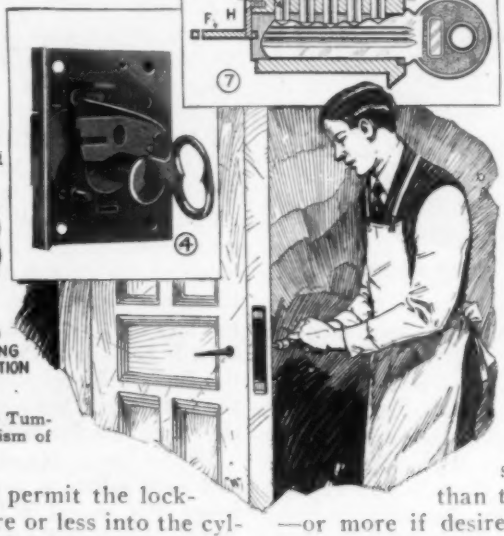
The next popular type of lock found about the home is the pin-tumbler, or cylinder, lock, commonly known as the Yale lock. This is a compact lock, virtually fool-proof and capable of unlimited combinations. Figs. 6 and 7 show the essential parts of this type of lock. It will be noted that the lock is composed of a cylinder, A, and a body, B, together with a series of pins, C and E, which serve to lock the cylinder rigidly in the body so that the former cannot turn. However, if the pins E are pushed flush with the curved face of the cylinder, then the cylinder can be turned with the key, and the bolt of the lock, which comprises the mechanism fastened on the inside of the usual door, can

be thrown back to unlock the door, through the parts G, H and F. The part shown here, in other words, is a sort of a gateway through which the key must pass before it can throw the bolt and unlock the lock itself. Now the pins of this lock are divided into two members, one called the combination pin, E, and the other the locking pin C. (The double split pin, comprising two pins for the locking pin, will be explained later.) The combination pins fit into the cylinder, with the locking pins pressing down on them because of the coiled springs, D. Normally, the combination pins, being of different heights, permit the locking pins to enter more or less into the cylinder holes, thus locking the cylinder with the body and preventing the cylinder from turning. A key which is properly shaped so far as the lengthwise grooves are concerned, may be inserted into the keyhole. Its teeth will raise the combination pins more or less. If the key is the correct one, the teeth will raise the combination pins to the correct height, thereby bringing the combination pins and the locking pins flush with the space between cylinder and body, and permitting the cylinder to be turned by the key.









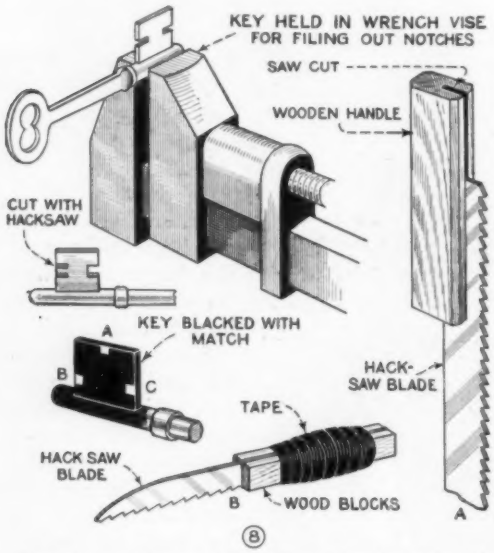
Cabinet Lock with Multiple Tumblers, and Internal Mechanism of Pin-Tumbler Locks

Fig. 6 shows the results of inserting the proper key, at the right, and the wrong key, at the left; note how the combination pins are lined up in the former.

The purpose of the split pin is to enable one key to fit just one lock, while another key may fit that lock and another lock as well. For example, the home and the garage may both be fitted with pin-tumbler locks, and the home key may be designed to fit both locks, while the garage key may be designed to fit just the garage lock. This is especially desirable when the help is provided with a key to fit just a certain lock, while the master has a key that will fit several doors. There is nothing more to such an arrangement than to have the two locks—or more if desired—arranged with the same combination as the house. The house lock, however, is provided with plain pins, while the garage lock is provided with a split pin. The chauffeur's key is arranged so as to operate the split pin on one section, while the master's key is arranged to operate the split pin on the other section, corresponding with the solid pin of the home lock. In this manner, one person may have a key to open a number of locks, while others may be provided with individual keys for their individual locks. This arrangement may be multiplied any number of times through the use of split pins.

To file a key for the pin-tumbler type of lock, it is necessary to take the lock apart. Some locks have provision for doing so, usually in the form of a sliding cap over the top of the body. Others have no such provision, and then it becomes necessary to file off the top of the body so as to ex-

pose the springs, after which each of the parts may be removed. The key must be selected so that it will fit in the keyhole, having the proper arrangement of side slots. If a key is at hand for the lock, the



Hints for the Amateur Key Filer, Showing How the Position of the Wards Is Located without Taking the Lock Apart

lock need not be filed apart. Instead, the screws and plate may be removed from the rear of the body, after taking the lock proper from the door; the key inserted so as to line up the combination pins, and the cylinder withdrawn, so that the combination pins remain in the cylinder while the other pins and springs fall out. This is not harmful, but it is quite a tedious job to reassemble the pins and springs. Nevertheless, this practice is perhaps simpler in the long run than to file off the top of the body and then have to make a new cover.

To file a key for the pin-tumbler lock, the blank should be inserted in the cylinder and the combination pins placed in their respective holes. Be sure the key is all the way in. Now gently tap the pins, which causes a small mark to be made on the edge of the blank to indicate where the filing is to take place. In filing a key of this kind, only one of the pins should be fitted at a time. It will be necessary to try the key frequently, and not to bear too hard on the file, since a small error in filing will render the key useless. A three-cornered file may be used for the purpose, but as it is not of the proper angle it must be tilted from side to side to approximate the angles of the original key. It is not advisable to hold a key that fits up against the one to be filed, because to file the original even slightly is apt to ruin it. Keys can be made in special machines, following the notches of the original and in no way affecting the accuracy and fit of the latter. This is the quickest and easiest way to duplicate keys.

Now a few words on key fitting in general. When a vise is not available, and especially when it is desired to do the fitting near the lock, a monkey wrench can be used, as shown in Fig. 8. Set up the knurled screw with a pair of automobile or lineman's pliers and the wrench will hold nearly as well as a vise.

To fit a key to a common mortise or rim lock, without taking the lock apart, obtain a key blank which will nearly or quite go into the keyhole, hold the key close above a lighted match or candle until smoked evenly and completely. Place the key in the lock as far as it will go and turn it back and forth, then remove from the lock and seek the bright spots where the black has been wiped off the key by the wards in the lock.

Bright spots are shown at A, B and C, and cuts must be made in the key to remove the metal at these points. Possibly the key will not go into the lock and bright spots may be found at the inside edge of the blade, indicating too little distance between the blade and the collar, in which case it will be necessary to file away some of the blade, if it is wide enough, or to work back the collar a bit. If no thin "warding file" is at hand, cut in the key with a hacksaw as shown; then break out the thin piece and file smooth.

Bits of broken hacksaw blades make good key tools. Cut a hacksaw slot into the handle block, as shown in the illustration, then fill the groove with "smooth on" cement, and push the blade into the handle. Next day, the saw will be found solidly set in the handle. If no smooth on is at hand, set the blade with litharge and glycerin. A "ready-to-wear" file may be quickly made by placing two bits of wood on either side of the hacksaw blade, and then winding on tape to form a handle.

Practical Tar-Cutting Machine

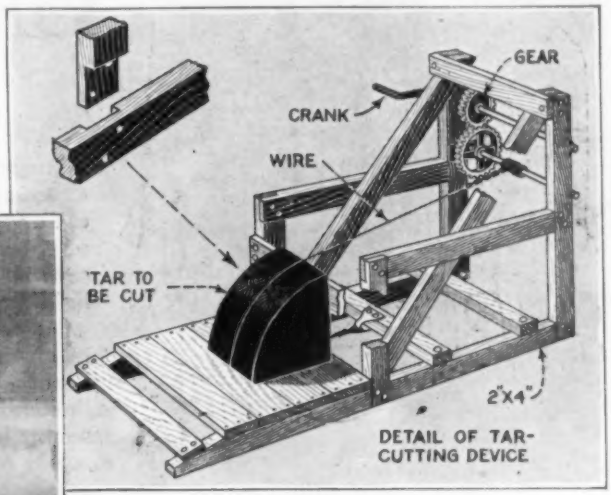
In construction work there is frequent need of tar, and the cutting of this product is more or less troublesome. One contractor made the machine for this purpose shown in the photo, and found that it was effective and timesaving. It consists of a wooden framework with a platform at the front for holding the cakes of tar to be cut,

Platform and Mechanism for Cutting Large Cakes of Tar with Little Effort and at a Considerable Saving of Time

and the operating mechanism, which comprises a crank, two gears and a winch arrangement, at the other end. A stout wire is attached to the winch and to the framework so that it can be placed over the cake of tar. Then, upon turning the crank, the wire is drawn through the tar with little effort.—Roy M. Singer, Chicago, Illinois.

Gassing Best Means for Killing Ground Hogs

With steadily increasing farm acreage in the middle west given to legume crops, alfalfa clover and soy beans, the damage caused by the ground hog, or woodchuck, is becoming serious. It is especially fond of these crops and, besides, its burrowing makes the ground rough and hard to cultivate and often starts the forming of a ditch. Trapping and bounties have been used to fight the pests, yet they seem to be on the increase. Gassing them is a new method which has been tried successfully in several localities in Iowa. Calcium cyanide is used. In the entrance to



the burrow 2 or 3 oz. of the chemical is placed. A long-handled kitchen spoon gets the material far enough into the hole, then the entrance is plugged with grass, sod, or an old gunny sack, to avoid any risk to the operator. The moisture in the soil causes the calcium cyanide to give off hydrocyanic-acid gas, which is so deadly that it kills the pests in a few seconds. In one township of Iowa, where about 6,000 burrows were treated, only a very few of them opened again, showing that the animals had been killed in great numbers.—F. L. Clark, McGregor, Iowa.

Simple Paintpot Hook

A simple paintpot hook intended for use on a ladder is shown in the drawing. It consists of a length of No. 9 galvanized-iron wire bent to the shape shown. Fasten it to an ordinary spring snap. This allows the bucket to hang on the outside of the ladder, and the bail will assume a slanting position so that it is out of the way of the brush.—W. W. Irwin, Albany, Ohio.

How to TAKE CARE GASOLINE

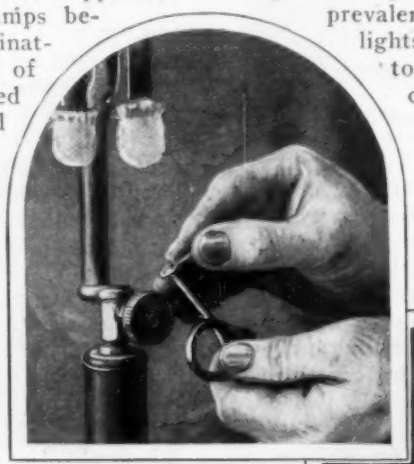
by L. B.

WHERE rural communities are as yet unsupplied with electric current for lighting, gasoline lamps have supplanted the old-style kerosene lamps because of their great illuminating power. Thousands of such lamps are now used and homes are well lighted even without electricity. But, like anything else, gasoline lamps are sometimes subject to little troubles that affect the illumination or cause the lamps otherwise to function improperly.

When the flame dims, the valve steams or the illumination is irregular, just keep in mind that there is practically no danger provided the filler plug is not removed and the gasoline in the fount exposed to air while the lamp is lit or the mantles are in the least bit incandescent. Turn the valve off and wait until the mantles become white and cold and then you can proceed to trace the trouble and remedy it. Troubles with the gasoline-lamp illumination can be traced to either an improper mixture of gasoline and air in the mixing chamber over the mantles, a plugged generator or impure or dirty gasoline. Either of the first two troubles may be due to several causes, but the elements of poor lighting remain unchanged.

First, last and always, use a good grade of gasoline and strain it when filling the fount. This is essential because the gasoline enters the mixing chamber through a very minute hole and any impurities will surely plug the aperture and cause loss of pressure. Also, good gasoline will form much less carbon than cheap grades, and this keeps the generator passage clear for its normal life.

Dependent upon the above is the most prevalent cause of dimming lights: a carbonized generator or plugged tip. These conditions usually give warning by a gradual dimming of the light, which may extend over a period of several nights. More and more air pressure



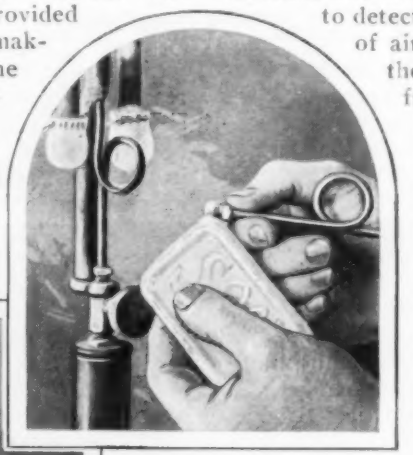
Unscrewing Generator Tip; Right, Inspecting Lead Washer on the Filler Plug

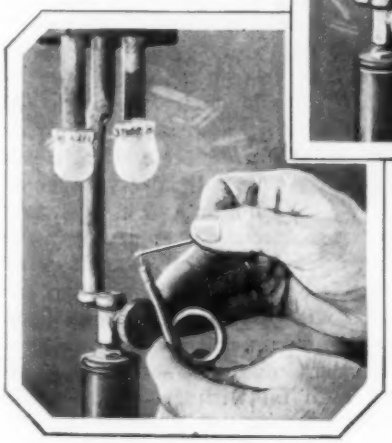
OF YOUR LAMPS

Robbins

must be pumped into the fount as the dimness increases, but finally the brilliancy falls so that the lamp is practically useless. Assuming that there is the required amount of gasoline and air in the fount, it is necessary to remove the generator. This is best done by grasping the circular portion of the generator with the fingers of the left hand and then turning the nut at the bottom of the generator to the left, which unscrews it from the seat below and between the mantles. Use the wrench provided for the purpose or a pair of smooth-nosed pliers.

Lift the generator from its seat, taking care not to injure the mantles, and first inspect the tip. This may be cleared of obstructions by means of the fine wire in the holder usually provided for the purpose by the makers. If, on retrial in the lamp, the light still remains dim, the trouble probably lies somewhere else; undoubtedly the generator is carbonized. Prove this by removing it once more from the lamp and taking off the tip with the wrench. Then blow hard through the threaded end of the generator and attempt to detect the presence of a stream of air by holding the back of the hand close to the end from which the tip has been removed. In a clean generator, you will be able to feel a fine, cool stream of air on the skin. If the generator is plugged, no passage of air can be felt under normal lung pressure. Throw the generator away and substitute a new one. Trying to clear a carbonized generator is useless labor. The fine passage is filled with asbestos which, with an accumulation of carbon from long use and low-grade gasoline, eventually makes a solid mass that thoroughly closes the passage to any flow of gas even under high pressure.





Above, Soaping the Generator Threads; Left, Cleaning Out Generator Tip

When a new generator is to be put in the lamp, clean out the tip and blow through the generator as previously described, so you will be sure of a

good replacement at the start. Never use a needle to clear a tip. It is much too big and will ream the tip hole so large as to render it useless. This hole has been drilled with great accuracy and is large enough to feed the gas into the air chamber above to form a mixture of the right proportions. A larger hole will admit too much gas, the mixture will be too rich and the mantles will blacken, thus destroying the proper functioning of the lamp. When replacing a generator, it is wise to rub the threads of the nut with soap. This is unaffected by gasoline and makes a tight joint. If not soaped, gas is likely to seep around the threads and will sometimes take fire and burn with a small flame. While there is no danger in this, a little soap on the threads will prevent it and make a workmanlike job.

Above, Testing Flow through Valve; Below, Removing Screen from Lower End of Mantle Tube

Now let's consider blackening of the mantles. This occasionally happens from no apparent cause, but there is a reason for it nevertheless. As previously stated, it may be caused by a too large hole in the generator tip. If so, the remedy is obvious: renew the tip. In some cases the air chamber above the mantles may be clogged with soot or other foreign matter. This rarely happens, but if it does, blowing the tubes out with a tire pump will usually clear them. Another cause may be that the screens at the lower ends of the tubes to which the mantles are attached may be clogged with scale that has dropped from above. Or perhaps they are burned through by heat. If either of these conditions is discovered, remove the screens from the tubes by using two pairs of pliers, as shown, and either clean the meshes or put in new screens. A carbonized generator may also cause this condition, and the removal and treatment of this unit have already been described.

Sometimes, after all the foregoing remedies have been tried, there is still lack of pressure through the generator with one or more of the unsatisfactory results following. There is still the possibility that some foreign substance has been forced up from the fount to lodge in the valve and thus cut down the flow of gasoline to that point. To test this, remove the generator and turn on the valve very slowly. If no gasoline spurts out into the fount with plenty of pressure, you have found the trouble. Often opening the valve wide and closing it as quickly as possible will clear it. If not, try running a fine, flexible wire through the crooked opening. Always be careful not to get any soap from the generator threads into this seat, as it will surely lodge in the valve passage below and clog it. As a last resort, release the pressure from the fount and, opening the valve, try forcing air through it by means of an automobile pump. This will often do the trick. Then pour out the gasoline in the fount, strain it, pour back and flush it a second or third time, and then fill with freshly strained gasoline.

Occasionally air pressure cannot be retained in the fount. This, of course, causes the light to dim after the lamp has been lighted a short time and might be mistaken for plugged passages above the fount. A few strokes of the pump will show whether pressure in the fount has escaped. The only probable place this can happen is through the filler plug. Remove the plug, turn it over and inspect the lead washer. If nicked or torn it will surely allow some air to escape. A new one can be quickly slipped on and reseated by simply screwing the plug down in place. Then again there may be a speck of dirt at the bottom of the air stem in the plug. Unthread it and take it out, then squirt a bit of gasoline around it. This will loosen any dirt that may have accumulated around the ball check in this passage and thus allow the ball to close automatically, as it should when the pump is removed from the stem. These two points, and a leaky valve above, are the only three logical points from which air pressure can escape from the fount. So, by eliminating the valve first, any loss of pressure can finally be traced either to the filler-plug washer or the air-stem ball check inside the plug. After considerable use the leather washer to the plunger inside the pump may become so worn as to refuse to pump air into the fount. When this happens, remove the two little screws in the wooden plug in the top of pump, pull out the plug and then remove the plunger rod. As shown in the photograph, the nut holding the plunger washer in place can be removed with a pair of slender-nosed pliers and a new one installed by reversing the procedure. Then a drop of thin oil will lubricate it.

Removing the Nut That Holds the Washer on the End of the Pump Rod

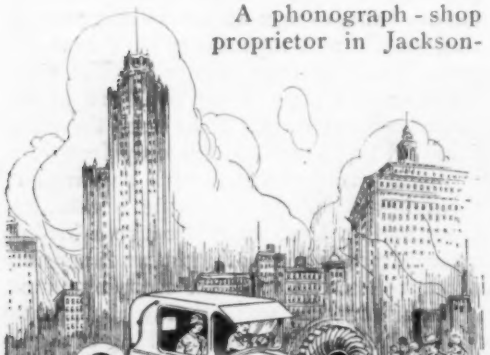
The principle of the lamp is simple. It consists in forcing a fine stream of gasoline through a continually heated copper tube, to mix with the right proportion of air and flow downward into the mantles as a gaseous mixture. Use clean gasoline and a good air pressure in the fount to force it up. Then keep the valve free and tight-closing, use only free-flowing generators and tips with openings of right bore. When a mantle breaks, replace with a fresh one, because a broken mantle means loss of light and possibly a cracked shade from an escaping flame.

Assuming that you already understand the lighting and general handling of a gasoline lamp, with proper attention and care it should last for years with only an occasional replacement of some part that will naturally burn out from the intense heat. Luckily these parts are few and cost little. Study the few little tools furnished by the manufacturers. Each serves a purpose and should be used when necessary. Then, when a little trouble occurs, you will know how to correct it. There is absolutely no reason for shelving such a lamp because it has failed to shed its former brilliancy. Too many times this has been done, so take down the idle lamp, and, by following the foregoing rules and the accompanying illustrations, you should be able to remedy the trouble.

Protecting Tractor Radiator

A shield made by attaching heavy hail screen to a wooden frame and hinging the latter to the base of the radiator of the tractor prevents corn stalks from breaking and bending the fins of the radiator. The frame with the screen is set at an angle, leaning forward to push the stalks down. It is attached to the top with a brace and hinged, to facilitate its removal and allow cranking of the motor.

Rotating Advertisement on Auto

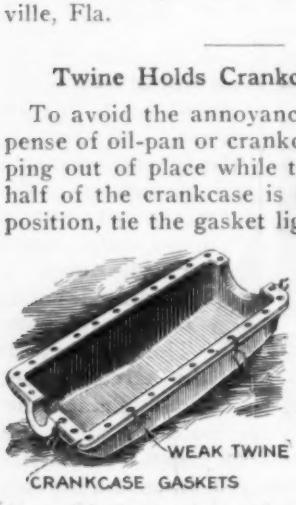


Advertising Phonograph Records by Means of Rotating Wheel on Auto Radiator

A phonograph-shop proprietor in Jacksonville, Fla., who is a firm believer in the advertising value of motion, made a large wheel out of tin, arranged it so that it would turn on a pivot when set in the wind and mounted it on the radiator of his auto. A full-size picture of a phonograph record was pasted in the center of the wheel. As he travels around the city this rotating sign attracts much attention. —Russell Raymond Voorhees, Jacksonville, Fla.

Twine Holds Crankcase Gaskets

To avoid the annoyance, delay and expense of oil-pan or crankcase gaskets slipping out of place while the pan or lower half of the crankcase is being fitted into position, tie the gasket lightly in place by means of lengths of easily broken twine, threaded through two or more holes in the gasket and pan, as shown in the drawing. If shellac is used to fasten the gasket, time must be allowed for it to dry before fitting the pan and it always will be a slow and unsatisfactory job to clean off the old gasket when a new one is needed. By tying the gasket in place, the pan can be set into position without any danger of the gasket slipping off and several studs can be started. Then the twine is pulled out and the rest of the studs are driven in.—G. C. Douglas, Raleigh, N. C.



CRANKCASE GASKETS

Keeping Soapstone Handy

While running a lathe I had occasion to use a piece of soapstone very often to determine if the stock was properly centered in the chuck. My soapstone was always getting lost or broken, and I spent more time looking for a new stone than I did in centering the stock. So I devised the simple method of attaching a dozen rubber bands to the stone and fastened these to a length of strong twine suspended from the ceiling. This ended my trouble; the soapstone was always at hand yet entirely out of the way.—Thos. H. Duffy, Juniata, Pa.

Simple Holder for Soldering Copper

The user of either the electrical type or the flame-heated soldering copper will appreciate the attachment shown in the drawing. Bend a small piece of iron or spring wire to form a large coil and clip this to the bit so that the handle end will be heaviest. When hot, the iron is rested on this simple holder without burning the bench or table top.—G. A. Luers, Washington, D. C.

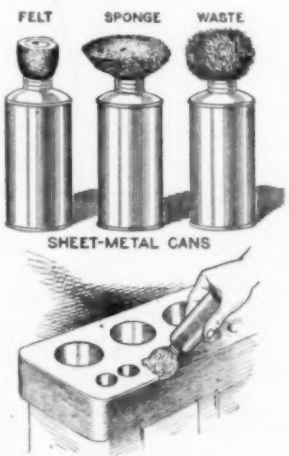
Easily Made Socket Wrenches

Sections of seamless steel tubing, cut from the frame of a discarded bicycle, can be made into strong, serviceable socket wrenches, which will reach almost inaccessible places and take a firm hold on stubborn nuts and hexagon machine-screw heads. Get a nut of the size you

wish your finished wrench to fit and, after screwing it to a bolt of the same thread, clamp the bolt firmly in a vise. Then, with a hacksaw, cut a piece of tubing from the bicycle frame, long enough to provide a sufficient handhold. Heat the end red-hot and drive it quickly over the nut, tapping the sides to a snug fit. If, by chance, the tubing is a trifle too large, it can be shrunk easily while hot by hammering carefully and turning the metal beneath the hammer, and if too small, a tapering punch driven into the end will enlarge the opening sufficiently. Drill a hole through the handle, insert a piece of round stock for additional leverage, touch up the rough spots with a file, and you will have a good wrench.—J. W. Briggs, Poughkeepsie, N. Y.

Practical Gasoline Brushes for Cleaning Parts

Gasoline brushes for cleaning parts can be made up quickly and at small cost, as shown in the illustration. Open-mouth cans are fitted with a sponge, a roll of felt or a wad of waste. As these brushes are absorbent, they take the gasoline which is contained in the can and apply it to the surface to be cleaned. The use of the materials suggested depends upon the need for either a slow or a rapid feed; the sponge permits an almost continuous flow while the felt only keeps moist. One feature of this method of handling the gasoline is that the brush can be set aside and the stopper will prevent the contents from evaporating.



Inclined Runway to Concrete and Sand Bins Which Feed a Mixer Located in Excavation

Runway and Large Material Bins Save Time in Concrete Mixing

By installing his mixing plant and hoisting mast in one corner of the excavation of a building with bins holding 50 yd. gravel and 30 yd. sand, which are filled directly from trucks, a western contractor saves a great deal of time and labor. In order to reach the bins with the trucks, a runway of heavy timbers was laid to them from the curb. The wheelways were made of narrow strips, laid crosswise to afford traction, as there was considerable rise in the runway. Guard rails of heavy timber were provided on the sides. Three men mix concrete and it goes into the building at the rate of a batch, or ⅓ cu. yd. of concrete, per minute. This method eliminates the gang of laborers who usually wheel the material.—J. C. Coyle, Denver, Colo.

¶To split off a tight machine nut with a cold chisel is sometimes more economical than to risk ruining the bolt threads.

Simple Device for Detecting Leaks in Water Pipes, Made from an Old Telephone Receiver

Device for Detecting Water Leaks

A water company's instrument for detecting leaks in pipes having been broken accidentally, an inspector made a simple and efficient device to take its place. In the small end of an ordinary telephone receiver case he placed a cork, and after cutting from a broken steel spoke in a truck wheel a piece about 3 in. longer than the receiver, he soldered a metal diaphragm, of the same size as the thinner diaphragm removed from the receiver, to one end of the steel wire and filed the other end to a point. Then he removed the cap from the case, inserted the point of the spoke and forced it through the middle of the cork, seating the new diaphragm in the place the phone diaphragm had occupied. The cap was then screwed on again. When the point of the spoke is applied to a pipe, or to any metal connected with the water system, and the ear placed at the receiver, it is easy to hear running water if there is even a small leak within 200 ft. Leaks 500 ft. away have been detected with this device.

Precautions to Observe in Melting Lead

When working with hot solder or lead the experimenter should take care to prevent the molten liquid from popping into his face when he pours it. Any metal, such as steel and iron, absorbs a certain amount of moisture and, when hot lead or solder is poured into a mold of such material, the liquid will likely splash in every direction, if the mold has not been preheated to drive out the moisture. This precaution never should be neglected. The heating can be done with a blowtorch or the molds may be placed over a gas flame. The same safeguard should be observed in adding bits of dirty solder or lead to a pot of melting metal. The fragments should be dropped in carefully so that there will be no splash, and all dirty pieces should be cleaned.

Sloping Floor for the Garage

Most garages have a perfectly level floor, but if you are building one it will be an advantage to slope the floor slightly toward the door. This enables you to roll the car out of the garage by merely releasing the emergency brake, without the necessity of starting the engine. The incline also prevents water from entering under the door and remaining on the garage floor.—Dale R. Van Horn, Walton, Nebr.

Sloping Concrete Floor in Garage Has Distinct Advantages

Cutting Down the Fuel Bill

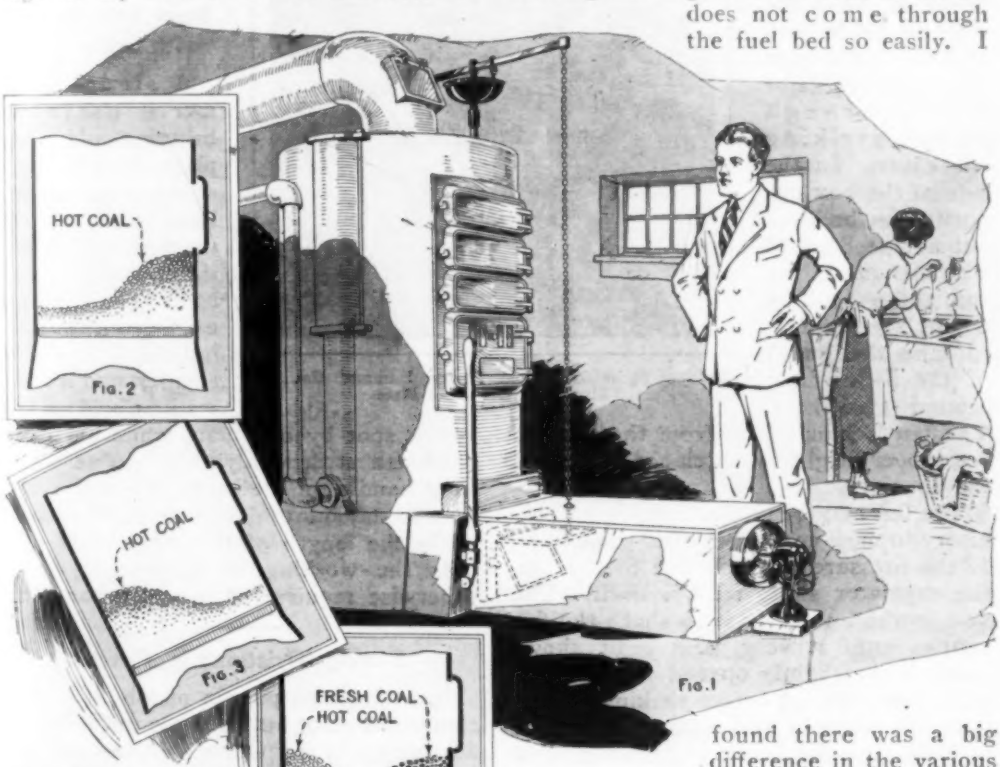
By N. L. REA

THE problem of burning the smaller sizes of coal will be an active issue with many householders this winter. Perhaps my experience will be interesting and instructive.

Two years ago I began experimenting with the aim of reducing my fuel bills. My heater is a standard vertical boiler designed for burning the larger sizes of coal. This has a rectangular fire box. First, I began mixing some pea with stove-size coal. Then I mixed two tons of stove, one ton of pea and a half ton of buckwheat. This worked so well that I bought some pea and buckwheat and kept them separate so I could experiment. I tried to obtain new grates with smaller openings for my boiler, but was unsuccessful and decided to try what could be done with the regular grates.

To make a long story short, I am burning No. 1 buckwheat and getting heat aplenty. The procedure is as follows: The grates are set so they are all even and the openings between them as small as possible. The ends of the shaker extension are marked so that I can keep them in this position. One pair of grates did not match the others and the grates were lowered and these two shifted to match with the rest.

A thin fire is started with chestnut or pea borrowed from the kitchen-range supply, then the buckwheat used altogether. A thinner fire should be carried than when burning the large sizes of coal, as the air does not come through the fuel bed so easily. I found there was a big difference in the various lots of buckwheat and occasionally a considerable variation in the same lot. Some will be nearly as coarse as pea and some will be near the rice-coal sizes. The coarser and medium parts will burn with



By the Simple Addition of a Fan for Forced Draft, and by Paying Attention to the Method of Firing, This Owner Cut His Coal Bill Seventy-Five Per Cent

natural draft, but the finer stuff needs some encouragement. Then, too, one may want to get heat in short order and the buckwheat is slow to respond to increased draft opening.

My thoughts naturally turned to some way of obtaining forced draft. There was a small 8-in. fan that wouldn't be needed while the boiler was in service and I decided to try to apply that to my problems.

The arrangement is shown in Fig. 1, and is as follows: A box of galvanized iron, with one end open and having the concrete floor as its bottom, was made and set in front of the draft opening, its width being much greater than this. The box is nearly 2 ft. long. A ½-in. hole was bored through the cover, so located that the chain from the draft regulator drops through without striking the cover. In the side of the box opposite the boiler I cut a hole 8 in. in diameter near the top, and put a 2-in. collar, large enough to take the guard of the 8-in. fan, around the hole. The fan is blocked up from the floor to the proper height to match the collar and the opening.

Railway Spike Maul and Sledge Hammer Used to Straighten Old Steel Plate

The fan may be idle or running as necessary to meet coal or weather conditions. If the pressure runs up due to the fan, the regulator shuts off the draft. The best method of firing is to shake the fire gently, until a very faint light shows through the slightly opened ash-pit door. Shut down the fan before shaking. Then open the fire door and, with an old spade or light slice bar, work any dead coal or ash out of the back corners and along the side of the fire box. If there are any dead spots in the fire, work them down gently, keeping a thin crust on the bottom. (See Fig. 2.) Then work the bulk of the hot coal toward the back of the fire box, as shown in Fig. 3, leaving a thin layer of hot coals in front. The new coal is put in the front of the fire box, as in Fig. 4. This gives a belt of red-hot coal across the back so that every bit of gas from the fresh coal is burned. In general the depth of the fire is about half to three-quarters of that carried with larger coal.

Of course, it takes a little more care and some experimenting to learn the right way of handling the coal and draft, but I realized a saving of 75 per cent in my fuel bill and that was worth working for. The radiators were equipped with vacuum-type air valves, and all valves repacked to eliminate air leaks.

Steel Straightened with Spike Maul

A sledge hammer is useful in bringing old steel plate back into shape if the irregularities can be reached with it, but if not, a spike maul, such as is used on every railway, is indispensable. The smaller end of the maul is held on the rough spot by one man, while a second workman strikes it with a sledge. The long handle on the maul allows the first man to stay out of danger from the sledge, while the length of the maul itself permits the working of spots that would otherwise require the use of a bar.

Fitting Wristpins in Pistons

In fitting wristpins in pistons it is customary to ream out the hole until the pin fits snugly in it. Often this method will be satisfactory, but there are some cases where a little more labor will result in a more lasting job. Cast iron and bronze are not always of uniform hardness. Sometimes when a hole is reamed the tool

goes through, the hard spots recede till the reamer is out of the hole and then spring back. This happens especially with a dull reamer. The spring of the metal is slight yet sufficient to make a loose fit after a short while. When a wristpin is driven tightly through such a hole, it bears against the metal only at certain spots, with the result that the hole will not keep its size very long. A better job, because more lasting, is made this way: Ream out the hole about .0005 in. smaller than the wristpin. Drive the pin through after it has been coated with Prussian blue or chalk. The high spots will show up shiny. Carefully remove these with a scraper; drive the pin through a few times, and repeat the scraping till the connecting rod will fall by its own weight when assembled. In scraping the hole, take care to work in different directions; that is, cross the scraping marks to prevent vibration marks. If no micrometer is at hand, another method can be followed. When the hole is reamed until the wristpin starts to go into the hole tight, or starts to bite, it is ready for scraping. A clearance of .002 in. will produce a knock at high speed, the first thousandth is the most important. Pistons get out of round sometimes when driving the wristpin in, even without scraping, but can easily be made round again by light pressure in a vise. Holding it in the hand and hitting it with a wooden mallet or a soft hammer will also do the job.—J. H. Smit, Newark, N. J.

Combination Gauge and T-Square

Carpenters and cabinet makers will find the combination gauge and T-square shown in the drawing very useful. It consists of an ordinary steel rule and a wooden head provided with cleats to hold the rule at right angles. The combination takes less space in the tool box than a separate gauge, ruler and T-square, and is just as handy as the latter.

Shield Stops Flying Rivets

Many injuries were suffered by the men in a Denver steel shop from rivets flying through the air, when they were driven out by an air hammer or with a back-out tool and a sledge, so a shield was provided to prevent this. This shield is bent at one end so that it can be hung up in front of the flying rivets. When driven out, they strike the shield and drop harmlessly to the ground.—Jos. C. Coyle, Denver, Colo.

Reinforcing Weak Wagon Wheels

Where wooden wheels are subjected to extremely heavy strain, as in hauling sand, cement, stone, etc., they can be strengthened by the simple and easily made device shown in the photo. It consists of a sheet-iron disk cut out in the center so it can be slipped over the hub on the inside of the wheels and fastened securely to the spokes with U-bolts. The disk offers a counter effect to the outward tilt of the spokes and prevents the wheel from collapsing, no matter how heavy the load may be.—Ralph W. McPherson, Wahoo, Nebraska.

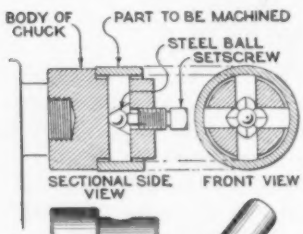
¶Wood may be preserved indefinitely by keeping it perfectly dry or submerged in still water, to prevent attacks of insects.

Safety Measure for the Electric Switch

The drawing shows a simple but efficient method of making an electric throw switch safe. Raise the switch to a height of about 8 ft. Cut down a broom handle to a length of 4 ft. and have a blacksmith make an iron clamp, about 8 in. long, on which the handle is to pivot, and two links which attach the handle to the switch. Drill two holes through the broom handle, one about 2 in. and the other 10 in. from the end, and mount the broom handle as shown.—Grover Brinkman, Okawville, Ill.

Expansion Lathe Arbor

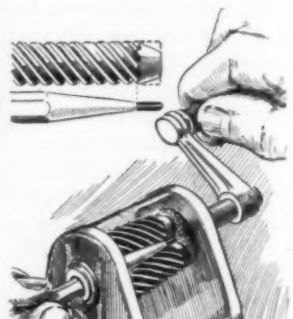
An expanding arbor for chucking pistons, bushings and other cylindrical parts in the lathe is very easily made from the accompanying drawings. The body is of steel or cast iron. Four holes, intersecting at right angles to the center, are drilled through the smaller part and these are fitted with sections of round bar stock, the outer ends of which are curved to the arc of the arbor, the inner ends being slotted with slanting V-grooves for a small hardened-steel ball. When the setscrew in the end of the body is turned in, the ball forces the expansion plugs out on four sides, gripping the work and holding it tightly. Only a slight movement of the wrench is necessary to set a part on the arbor or release it.—G. A. Luers, Washington, D. C.



Handy Case for Printers

One of my acquaintances, who is employed in a large printing shop, obtained a number of boxes in which sewing cotton had been packed, these being 4 in. wide, 6 in. long and about 1 in. deep. Cardboard partitions, sewed with strong thread, were arranged in them, in the same order as the standard quad cases. Being so small, the boxes can be carried to any part of the shop, the type set from the case and spaced on the spot, instead of running back and forth. Although the boxes are made of cardboard, they last for quite a long time and the cost involved is practically nothing.—H. R. Calhan, San Francisco, Calif.

Improving the Pencil Sharpener for Draftsmen's Use



Pencil sharpeners of the ordinary style grind the lead to a point which is unsuitable for draftsmen. This difficulty can readily be overcome by removing the cutters and grinding the cutting edges toward the handle smooth for about ⅜ in. as indicated. This clearance may have to be varied depending upon the casting.—W. J. Edmonds, Whitehall, N. Y.

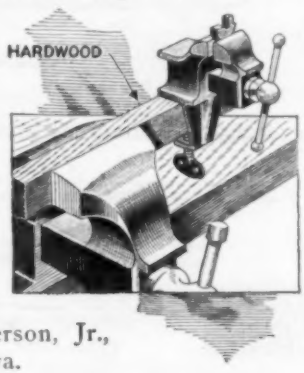
How to Adjust Coulter of Plow to Do Best Work

The rolling coulter of any plow has two particular purposes. First, it should cut through all trash, such as old stalks, grasses, etc., so that the portions of these

outside of the landside will not be turned in with the furrow. Otherwise this trash will be thrown on top of the plowed ground rather than turned under it. Second, the coulter should cut the earth in a clean, straight line so that the moldboard can lift the dirt cut with ease and without breaking or tearing it apart. To do these things, the coulter should be set so that it will run about 3 in. back from the point of the share, that is, the axle of the coulter should be set at this point. Following directly in line with the shin, or outer side of the moldboard, the coulter should be set to cut ½ or ¾ in. outside of this. This insures a cleaner-cut furrow and prevents the bank of the furrow from rolling down after the plow has passed. These adjustments should be made after the plow has been started, as it is then easier to find the line in which the swiveled coulter will run, than attempting to get it into the correct position after you have begun plowing.

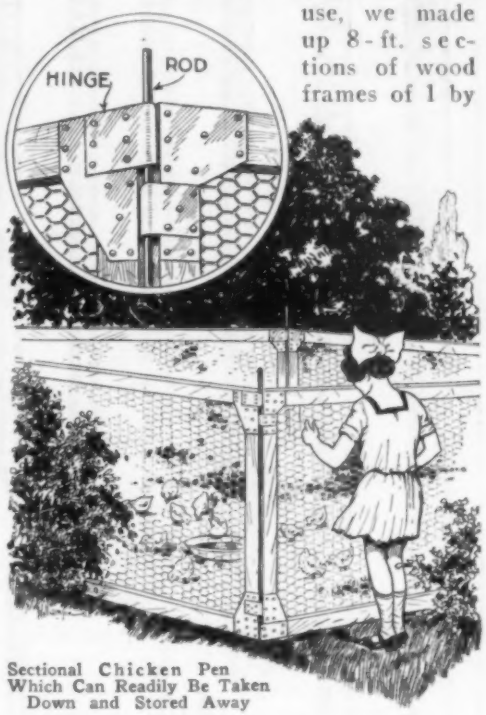
Large Vise Holds Small One

Experimenters often find use for a small vise, and if a large vise is available it can be used as a holder for the small one as shown in the illustration. The latter is attached near one end of a piece of 2 by 2-in. hardwood, about 1 ft. long. This is clamped in the large vise when in use, and can be held solidly in several positions. The small vise is better located for use than if attached to the top of the ordinary bench, which is often too low for small work. Also, as many small vises have a screw clamp on the base, they will not open far enough to clamp on the edge of a thick bench top. Some small vises have two screw holes for attachment to the top and these can be attached to the hardwood stick by means of two wood screws or stove bolts. —E. T. Gunderson, Jr., Humboldt, Iowa.



Portable Chicken Fence

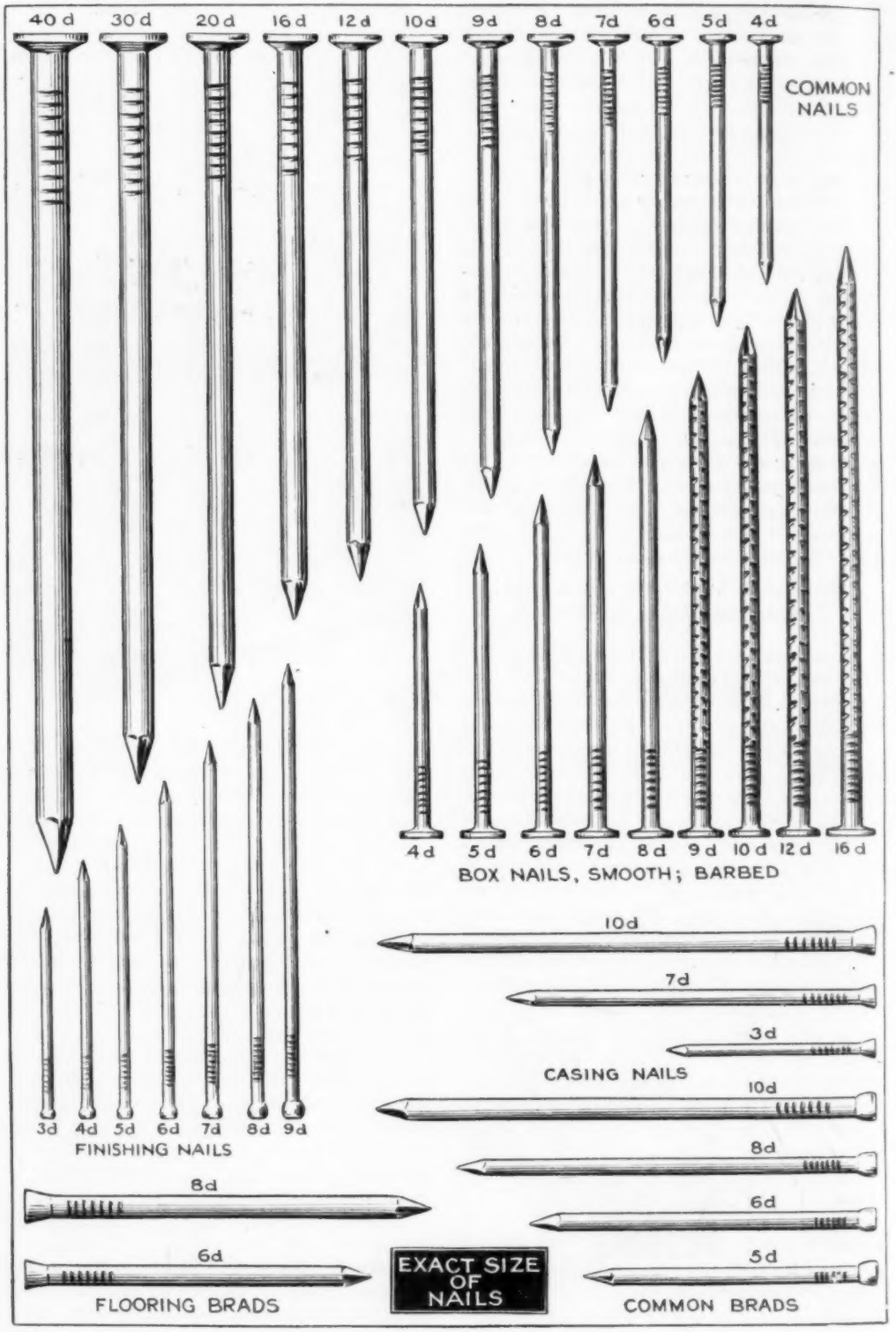
To do away with bulky chicken pens that were always in the way when not in use, we made up 8-ft. sections of wood frames of 1 by 2-in. material and covered them with fine-mesh netting. At the ends we tacked on loops of tin so that, when the ends of the frames were brought together and an iron rod run through the loops, they served as hinges. For the baby chicks we used as many of these sections as necessary to accommodate them. To insure greater stability the rods may be driven into the ground after they are inserted through the hinge loops. The pen is easily and quickly taken down or moved, and any size or shape of pen that best suits the needs and the ground on which it is to stand can be built. When the chicken season is over these sections come in very handy to protect the garden, new flower beds or to set up a tight but temporary fence wherever needed. And when all use for them is over, they can be taken apart and stored away.—R. W. McPherson, Wahoo, Nebr.



Sectional Chicken Pen Which Can Readily Be Taken Down and Stored Away

¶A special file should be provided for filing babbitt and it should be oiled slightly to prevent the metal from sticking.

Tack This Up in Your Home Workshop

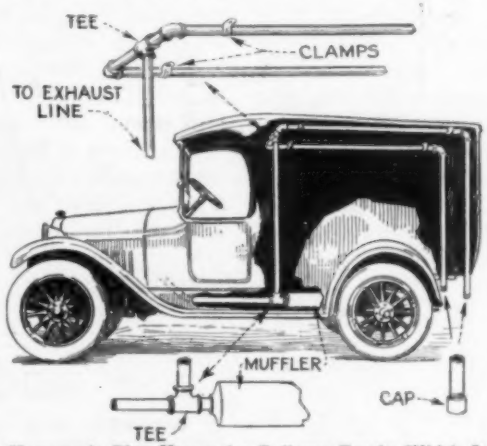


Cement for Asbestos Steam-Pipe Covering

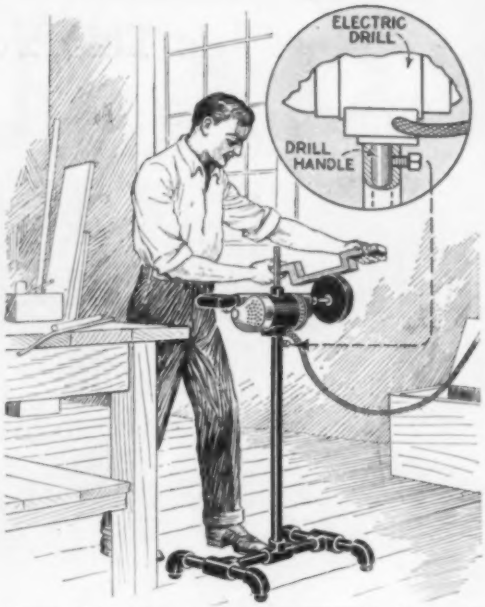
When steam pipes are to be covered with asbestos and the cellular covering so common nowadays cannot be had, a good covering paste can be made as follows: Mix a thick paste of ground asbestos and a solution of sodium silicate. Then add a small amount of calcium chloride to render the mass insoluble after the paste has set. Steam will not soften it, and it will cling to the pipe and offer good insulation.—L. B. Robbins, Harwich, Mass.

Heating the Delivery Truck

During winter months the groceryman, milkman and others, who must deliver their products some distance, will find a heater within the car of a great advantage. Commercial exhaust heaters cost from $15 to $25, including the installation, and a serviceable heater can be made at much less expense. Remove the exhaust line and muffler from the car and insert a tee between the forward end of the muffler and the end of the exhaust line, employing 1½-in. pipe fittings. Then screw a vertical section into the tee fitting and insulate the lower section of this where it comes in contact with wood. Place a tee fitting at the top of this vertical pipe and run two branches, as shown, through the truck body. Run two lengths down with their ends just projecting through the floor of the car. During the summer months the ends of the pipes are closed with pipe caps, but in the winter these ends are left open so that the exhaust gases will circulate around the car.



Homemade Pipe Heater for Delivery Trucks Which Is Attached to the Exhaust Pipe



Simple Holder for an Electric Drill Which Permits It to Be Used as a Grinder

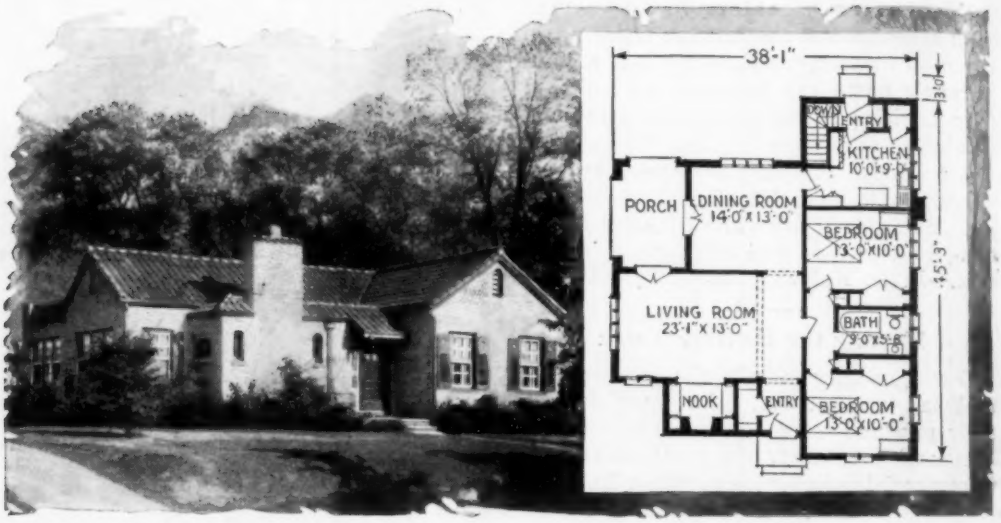
Portable-Drill Stand Enables Its Use as a Grinder

Besides being an ordinary holder for the electric hand drill, this stand permits the drill to be used as a grinder. It is made of lengths of ordinary gas pipe and fittings. The construction is simple and can readily be followed by carefully observing the drawing. A small setscrew is driven into the top end of the upright and locks the handle of the drill securely, as may be seen in the insert.

¶Rivets should be cut off before they are put into place, so that just enough metal is available for proper riveting.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid the appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

Is This Your Home?



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Plan No. 5B6

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

THIS bungalow should appeal strongly to those seeking individuality in a home. It is romantic in character, having its origin in the small farm houses of southern Italy. It has five main rooms, an inglenook, bathroom and five closets. The basement is only partly excavated, although a full basement can be provided.

The building plan of the house calls for hollow tile walls on masonry foundations. The exterior finish is troweled stucco. The roof is of mission tile. A lot from forty-five to fifty feet in width will be required.

There are many interesting features. The general form is unusual, and the treatment of the inglenook and chimney is delightfully impressive. The break in the roof around the chimney softens the outline. The arched entrance doorway, well-proportioned gables, close cornice and casement windows with solid outside blinds combine interesting details, all of which contribute to a successful whole and a happy blending of the various units.

The living room is unusually long for a house of this size, twenty-three feet. An inglenook, containing fireplace, seats and bookcase is the outstanding feature of the room. The dining room faces the garden, and opens directly onto the rear porch. The kitchen is provided with every working convenience, plenty of cupboards and a storage pantry. The bedrooms are separated from the main part of the house by a private hall. Here is a bungalow of distinction that can be built in any section of the country.

Home Builders' Questions

Q. Please advise what is proper to use on a shingle roof, paint or stain? A. You may either paint or stain your shingles. In any case they should be preserved with creosote applied under pressure. It can be stained or paint can be applied over it.

Q. Someone has told me that I can get a powdered paint that will be cheaper than ordinary paint. Can I use this for exterior work? Where can I obtain this and how is it mixed? A. The paint you are inquiring about is so-called "water paint." It cannot be used for exterior work as it will wash off. Paints that are subjected to weathering must be mixed with a vehicle of oil. Water paints can be obtained in any paint shop.